Bonner Concept Plan

Addendum for Concept Plans

This concept plan was originally adopted as a Guideline under the Territory Plan. These original content of the plans have not been amended since their adoption, but are included in the new Territory Plan and have statutory effect.

Under the *Planning and Development Act 2007,* a concept plan:

- applies the principles and policies in the structure plan, to future urban areas (formerly know as defined land); and
- is a precinct code in the Territory Plan.

A concept plan is used to guide the preparation and assessment of estate development plans (which are development applications), and can also be used to assist in the assessment of development when an area ceases to be a future urban area.

In this Concept Plan, any references to Land use Policies should be read as a reference to zones.

Consistent with the ACT Government's Affordable Housing Action Plan, the Concept Plan is amended to require that a minimum of 15% of all dwellings in the suburb be affordable housing product.

To provide diversity in affordable land and housing products to meet the Government's requirement, the controls for blocks up to 250m2 have been incorporated into Residential Zones Development controls, which need to be considered during the subdivision design.

To give effect to the Government's Affordable Housing Action Plan, this Concept Plan is further amended to specify the following locational requirements for Compact Blocks:

- compact blocks must be located opposite high quality open space. If this is not possible, then located within the vicinity of 100m from high quality open space or parkland or alternatively adjacent to a wide verge with high quality landscaping and medium sized street trees;
- if the compact block is accessed from the front, the block should be located on an internal local road and not fronting a main collector road;
- if the compact block is accessed from the rear, the blocks can be located fronting a collector road;
- compact blocks may be suitable for corner blocks and section ends but may also facilitate a narrower section depth.
- compact blocks and the adjacent public realm are required to be integrated so that a high quality streetscape is provided for the residents, which includes on-street parking (as required), street trees, verge crossings, services, footpaths and garbage collection points.

Estate Development Plans prepared under this concept plan must have regard to these requirements. Any amendments to the concept plan other relevant codes within the Territory Plan in order to give effect to these requirements, will be undertaken in accordance with section 96 of the Planning and Development Act 2006. That section requires the Authority to vary the plan once and estate development plan is approved, to remove the Future Urban Area overlay and identify the zones to apply to the land consistent with the estate development plan. Section 96 also enables the Authority to incorporate any other element of the estate development plan that should be ongoing, such as the identification of compact blocks (if necessary).

1 INTRODUCTION

1.1 BACKGROUND

The new town of Gungahlin was initially planned in the 1970s to contain a population of approximately 100,000 people. Development of Gungahlin commenced in the early 1990s and the district now has a population of approximately 25,000 people. Gungahlin is the major development front for population growth within Canberra.

In 1998 the then Department of Planning and Land Management - PALM (now the ACT Planning and Land Authority- "the Authority") undertook a review of the northern undeveloped part of Gungahlin. This study set out the revised structure and planning framework for the area. The North Gungahlin Structure Plan and associated variation to the Territory Plan is the result of the study. The variation modifies the Territory Map, principles and policies for North Gungahlin, including the suburb of Bonner.

The recent completion of Horse Park Drive to the Federal Highway and Majura Road is an important piece of related infrastructure work, connecting Gungahlin as a whole and the future suburb of Bonner to the employment centres in central Canberra and Fyshwick.

The proposed new suburb of Bonner is located to the north of Gungahlin Town Centre and the existing suburb of Amaroo and between the future residential areas of Forde to the east and Jacka to the west. Bonner has a total area of approximately 260 hectares. The development target is approximately 2,300 detached dwellings and approximately 340 medium density (attached) dwellings, equating to a population of 6,600. The upper reaches of the site in particular enjoy outstanding views to the west and south and immediate access to native bushland, in Mulligans Flat Nature Reserve.

Bonner is part of the ACT Government's Land Release Program. The first stage release for Bonner is scheduled to occur in late 2004. It is proposed the Bonner will be developed in stages, with the southern area comprising Stage 1.

2 CONCEPT PLAN

2.1 DESIGN PRINCIPLES AND THE CONCEPT PLAN

2.1.1 Urban and Landscape Design Principles

Design Principles

A series of design principles have been specifically developed for the concept design of Bonner. They incorporate the relevant planning princples in the North Gungahlin Structure Plan and are derived from the Project Objectives. These principles, grouped under major design elements / issues, are:

Open Space

- Reserve hilltops for open space opportunities, offering local visual connectivity and distant panoramic vistas
- Maximise pedestrian/cycle and habitat connectivity
- Avoid open space corridors becoming fire 'wicks' across the site
- Use open space corridors to connect community spaces/ facilities
- Incorporate WSUD principles – drain swales, water polishing ponds, stormwater detention
- Use park edge road system to separate the major open space corridors from areas of development to avoid privatisation of the public open spaces

Circulation Systems

Vehicular

- Establish clear hierarchy of function/capacity, reflected in road corridor width and urban and landscape treatments:
  - Arterial roads for commuter traffic, avoiding local centre
  - Collector roads for direct access from each residential precinct to the surrounding arterial roads
  - Internal spine road/boulevard for direct connection from all parts of suburb to school and local centre
  - Local roads for access to residences: narrow in width to discourage through traffic and encourage local shared use
- Provide contiguous fire access at the urban/ bush interface and local access to appropriately scaled development on the steeper slopes
- Where possible, align roads with surrounding local and distant natural or cultural features to achieve visual connectivity, orientation and local identity
- Separate development from open space by park edge road, avoid back fences adjacent to open space
- Give roads a high landscape amenity to encourage pedestrian use
- Maximise WSUD opportunities (vegetated swale) to support and sustain landscape amenity and pedestrian appeal
- Where appropriate, use local streets, car parks and laneways as shared spaces
- Where possible, extend the road verge to create opportunities for community space and parks with high level of landscape amenity

Pedestrian/ Cycle

- Create high landscape amenity of streets and roads to encourage pedestrian use
- Provide lighted footway and cycle access
- Provide circulation network which is more fine grained than street system (eg. mid-section connections between streets) to enhance pedestrian urban experience and provide greater connectivity to local community parks and informal spaces
- Provide direct links from residential areas to open space corridor system and on to neighboring nature reserves

Community Facilities

- Provide appropriate level of vehicle, pedestrian and habitat connectivity between Bonner and Forde and Bonner and Jacka
- Locate local centre in close proximity to medium density development and passing local traffic
- Locate school to take advantage of natural features and open space opportunities. School may be separated from the local centre
- Locate school centrally to its catchment, which comprises Bonner, Forde and the southern portion of Jacka

Water Sensitive Urban Design:

- Drain streets into vegetated swales
- Avoid permanent water bodies where possible: ephemeral systems preferred
- Use tree lined streets supported by vegetated swales to reduce need for irrigation
- Street trees provide shade reducing evapo-transpiration
- Incorporate shaded and narrow roads to reduce heat sink effect
- Where possible, utilize permeable pavements for infiltration

Local Community Spaces within a section

- Incorporate small-scale neighbourhood spaces, overlooked by immediate neighbours, for passive security. These should be multi-functional spaces incorporating car parking, dwelling access and informal active play areas

ESD and Section/ Block Orientation

- Where possible, create a road layout with a north-south east-west orientation to maximise ESD opportunities for each dwelling
- Configure block (development parcels) so that:
    - Living room faces north
    - West walls have small openings
    - Outdoor living space has north aspect
    - External spaces capitalize on seasonal/micro climate opportunities

Services

- Incorporate rear lanes and communal spaces to allow garage access and garbage collection at either street frontage, lane or common space
- Assume power/telecom/cable/gas/water underground

2.1.2 Ecologically Sustainable Design Principles

Detailed design investigations have been carried out as part of this project to develop specific ESD principles for Bonner which take account of the **suggest**ed housing types and the climatic conditions of Canberra and the site. These investigations have been guided by specialist inputs from an ESD consultant and are documented in full in **Appendix F of the background report,** which includes a full set of design guidelines / **principles for optimising ESD performance. The key ESD principles directly related to dwelling configuration, block size and shape and section orientation and dimensions are:**

- Buildings should generally be oriented within 20 degrees of the four points of the compass – buildings and blocks at 45 degrees to the cardinal points are not ESD optimal. On average small blocks (say less than 600m^2) means the block should be oriented north-south / east-west. On large blocks (greater than 750m^2)the dwelling need not parallel the boundaries and therefore block orientation is less important
- Locate living areas on north side of dwelling to maximize solar access (sun penetration) in winter and solar control (shading of openings) in summer
- Provide north orientation for bedrooms where also possible (living areas are first priority) otherwise east or west
- Maintain narrow building widths for cross ventilation
- Locate main private outdoor space to north of dwelling (northeast or northwest aspect is acceptable)
- Where possible, locate garage on south or west side of block
- Where possible, avoid second storey casting shadows over private outdoor space or neighbour's north facing walls
- Allow for deciduous trees to shade outdoor areas / building walls in summer but admit sun in winter

Figures 2.1.1 and 2.1.2 illustrate the application of these principles to sections facing north-south and east-west (where the blocks face east-west and north-south respectively) with single storey detached dwellings.

In broad terms, the application of the above principles has the following consequences:

- Detached dwellings
  - Block can be oriented with long axis north-south or east-west, since north facing living areas and outdoor spaces can be achieved in either case. Consequently, sections can face north-south or east-west
- Attached dwellings (row houses)
  - Block must be oriented with long axis north-south, so that party walls face east and west. Sections must therefore face north-south (i.e. with their long axis running east-west)

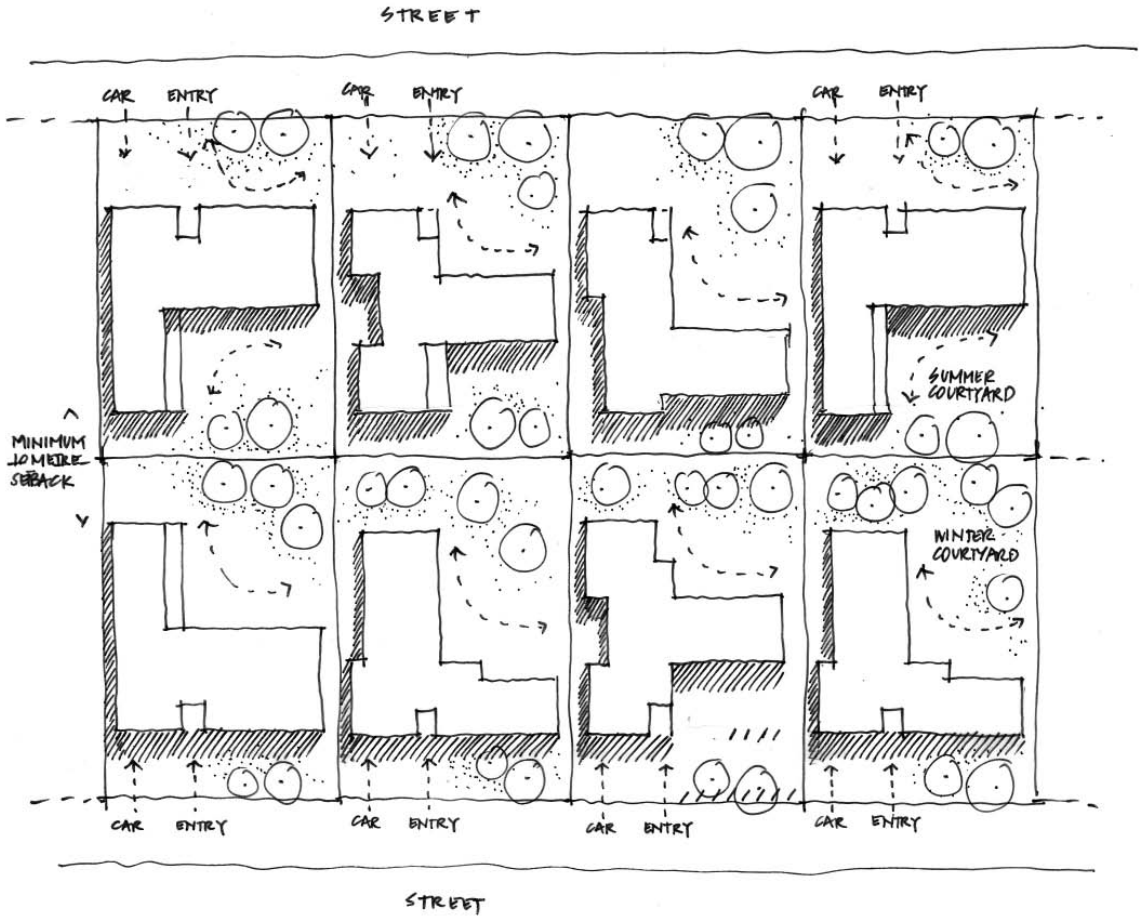


Figure 2.1.1 North facing section, east-west streets

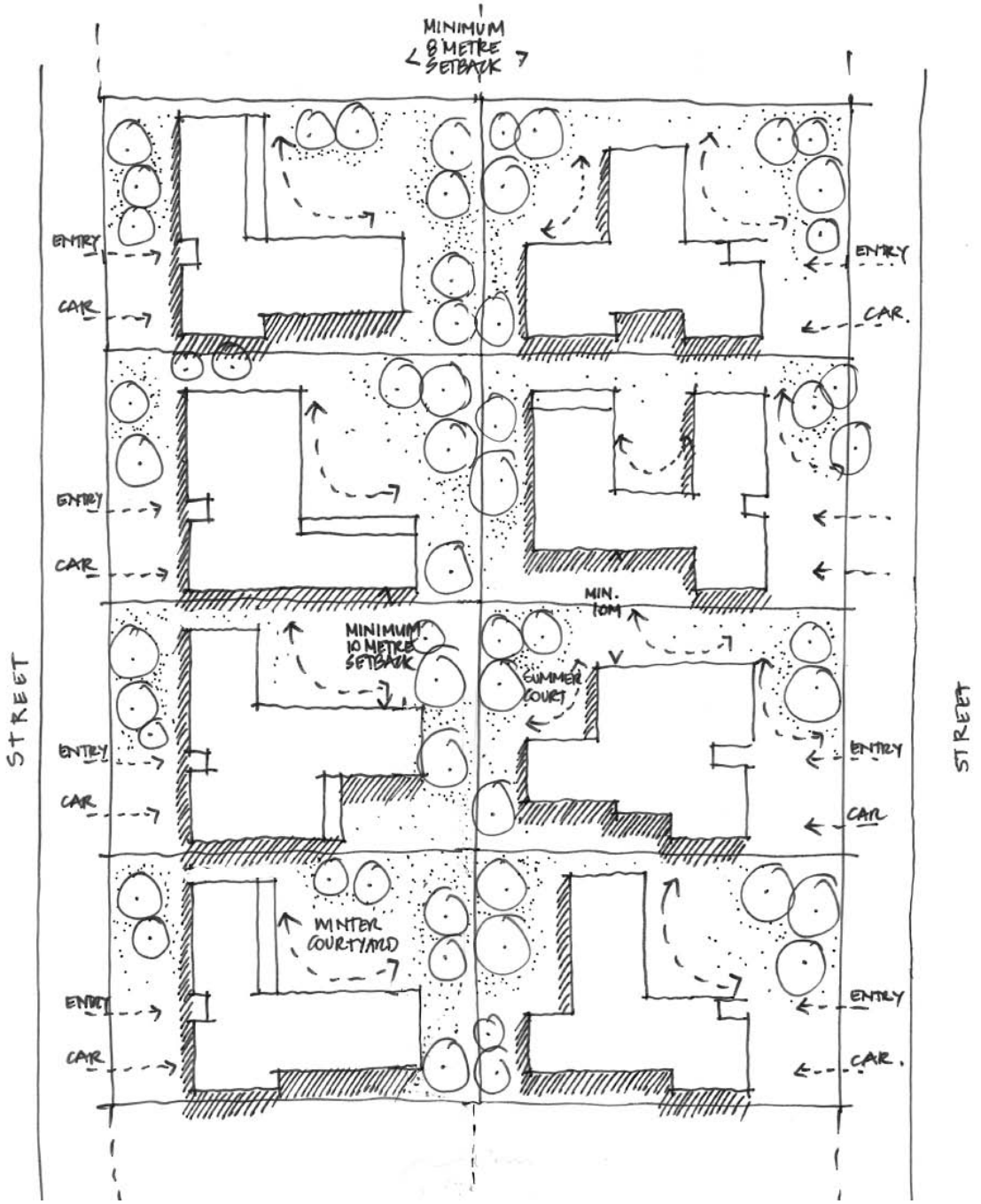
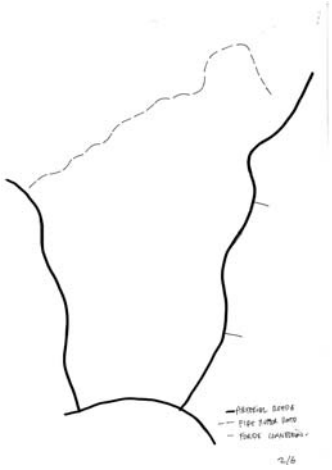


Figure 2.1.2 East/ west facing section, north-south streets

2.1.3 Design Structure

The following anotated diagrams explain the design rationale underlying the plan.



1 Arterial Roads at Edges

The arterial roads are placed on the outer edges of the Bonner development removing potential conflicts between inter-regional, commuter and local traffic.

2 Precincts

Response to the topography and open space corridor opportunities gives rise to five distinct precincts that combine to create the suburb of Bonner

3 Arterial Connections

Each precinct enjoys direct access to the arterial road system, avoiding the internal road and pedestrian circulation systems

4 Boulevard

The five precincts are directly linked to the school and local centre by an interior boulevard or "spine" road system, providing an alternative route to the busier arterial roads. A high level of landscape and urban amenity and a unique streetscape character provide for a consistent signature look to the boulevards, facilitating orientation. Some boulevards align with distant landmarks (Black Mounain Tower, Mount Ainslie), further enhancing orientation.

5 Bus Route

Various bus routes are possible linking all of Bonner's precincts as well as the north and south precincts of Forde with the local centre and school.

The Concept

The plan responds to the site's topographic features, including hilltops and drain lines which are used as open space corridor opportunities. The open space network creates distinct precincts which are unified by the boulevard road and pedestrian circulation systems. These systems are separate from the arterial roads which are located outside Bonner.

The following sections of this chapter describe in detail the various aspects of the Concept Pla**n.**

2.1.4 Key Features of the Plan

The concept plan for Bonner is illustrated in Figure 2.1.3, Concept Plan, and Figure 2.1.4, Indicative Subdivision Plan. The plan generally incorporates the urban and landscape design principles established for the project in Section 2.1.1 of this report. Its primary attributes are described below, generally using the same broad descriptors.

Design Response to Site and Programme: the Plan-making Language

One of the intentions of the Bonner Plan is that the physical form of the site and the built character of proposed development can be read in the plan itself. The design "language" of the plan has been developed to give expression to this idea.

On the lower and flatter parts of the site, which are to the south and southeast and closer to the urban environment of Gungahlin, streets and open spaces are laid out in a more formal, geometric manner. Circles, straight lines and right angles create an "urban" sense of place. This is also where medium density housing is proposed – on level land where an orthogonal street pattern, correctly oriented for maximum solar access and control, provides the optimal framework for attached housing.

On the more elevated and topographically varied parts of the site, which are to the north and adjoin the land use of Hills, Ridges and Buffer Areas, the plan-making language is organic and free form. Streets and open spaces are flexible and non-rectilinear, responding to topography, existing trees and other site features. Detached housing, on individual blocks or in groups, is proposed here. This form of housing can adapt most readily to the variable characteristics of the development sites in these parts of Bonner.

Open Space

Hilltops are reserved for public open space, ensuring local visual connectivity and distant panoramic vistas from the public realm. This strategy also minimises the visual impact of development in views to the suburb. Open space corridors link the hilltop reserves, forming continuos north-south and east-west connections across the site and providing additional pedestrian and cycle routes within and through it. Mulligan's Flat Nature Reserve is accessible from Amaroo, for example, without using major road corridors. The open space links also provide habitat connectivity.

In plan form, the project's major public open spaces adopt the design language described above. The southwestern hilltop parks, closest to the Amaroo Group Centre, are defined by circles. The circles closely follow the existing ground contours and in a sense "idealise" the topography of the hills. The elliptical form of the park to their north similarly reflects the form of the hill it occupies. The geometry is more complex, however, and provides a transition to the more informal organic shapes of the open spaces on the higher elevations in the north of the site.

In general, "park edge" roads are used to separate the project's open spaces from areas of development, as part of bushfire protection planning and to provide high levels of urban amenity. As described below, important Water Sensitive Urban Design principals and systems are integrated into the design of the plan's open spaces.

Vehicular Circulation

As diagrammed in Section 2.1.3 and described in detail in Section 2.3.5, the plan establishes a logical and hierarchical road network comprising:

- Arterial / sub arterial roads, which define the boundaries of Bonner on three sides and keep non-local traffic out of the suburb
- An internal boulevard or "spine" road system for direct connections within Bonner, in particular from all of its precincts to the school and Local Centre
- Collector roads for direct access from each precinct to the bounding arterial / sub arterial roads
- Edge roads, which define the suburb's public open spaces and provide continuous fire access at the urban/bush interface
- Local access roads servicing the residential development, with narrow carriageways to discourage through traffic and encourage local shared use.

The patterning of the road network uses the design language established for the project. On the lower and flatter parts of the site the streets are generally straight and laid out orthogonally. On the more elevated and topographically varied parts of the site the streets are non-rectilinear and configured organically.

An important feature of the road layout is the orientation of certain key streets. The southernmost and easternmost straight sections of the boulevard system align exactly with the telecommunications tower on Black Mountain and the northwestern branch aligns with Mount Ainslie. The collector road from Forde is on axis with the circular hilltop park to its west. The collector road from Jacka aligns with the school. These relationships are important because they assist orientation and way finding and contribute to the establishment of a unique sense of place. The axial relationships with distant landmarks connect Bonner to the greater city of Canberra and recall a key aspect of the Griffin plan.

Pedestrian and Bicycle Circulation

The plan incorporates pedestrian and bicycle circulation networks which are finer grained than the street system, providing a higher degree of accessibility and connectivity within the suburb and to the public open space network. For cul-de-sac's, for example, pedestrian and bicycle connections to adjoining streets are provided in addition to the access road into the cul-de-sac.

Local Centre and Community Facilities

The Local Centre is positioned at the geographical centre of the suburb and in close proximity to the areas designated for medium density housing. It is located at the focus of the boulevard road system where its three branches meet and has direct frontage to it. Provision is also made for other Community Facilities on a site adjoining the Local Centre.

The local Primary School is at the centre of its catchment, which comprises Bonner, Forde and the southern portion of Jacka. It adjoins the Local Centre and playing fields. Taken together these facilities create a social nucleus for the new suburb.

Ecologically Sustainable Design

All sections designated for medium density housing face north south (that is, their long axes run east west). This allows the living areas and associated private outdoor spaces of attached housing units to face north, which is optimal for passive solar design.

Water Sensitive Urban Design principles are adopted throughout. Tree lined local access roads, with vegetated swales where grades permit, reduce stormwater run-off and the need for street tree irrigation. Other important stormwater management elements include vegetated floodways, water quality control ponds and wetlands.

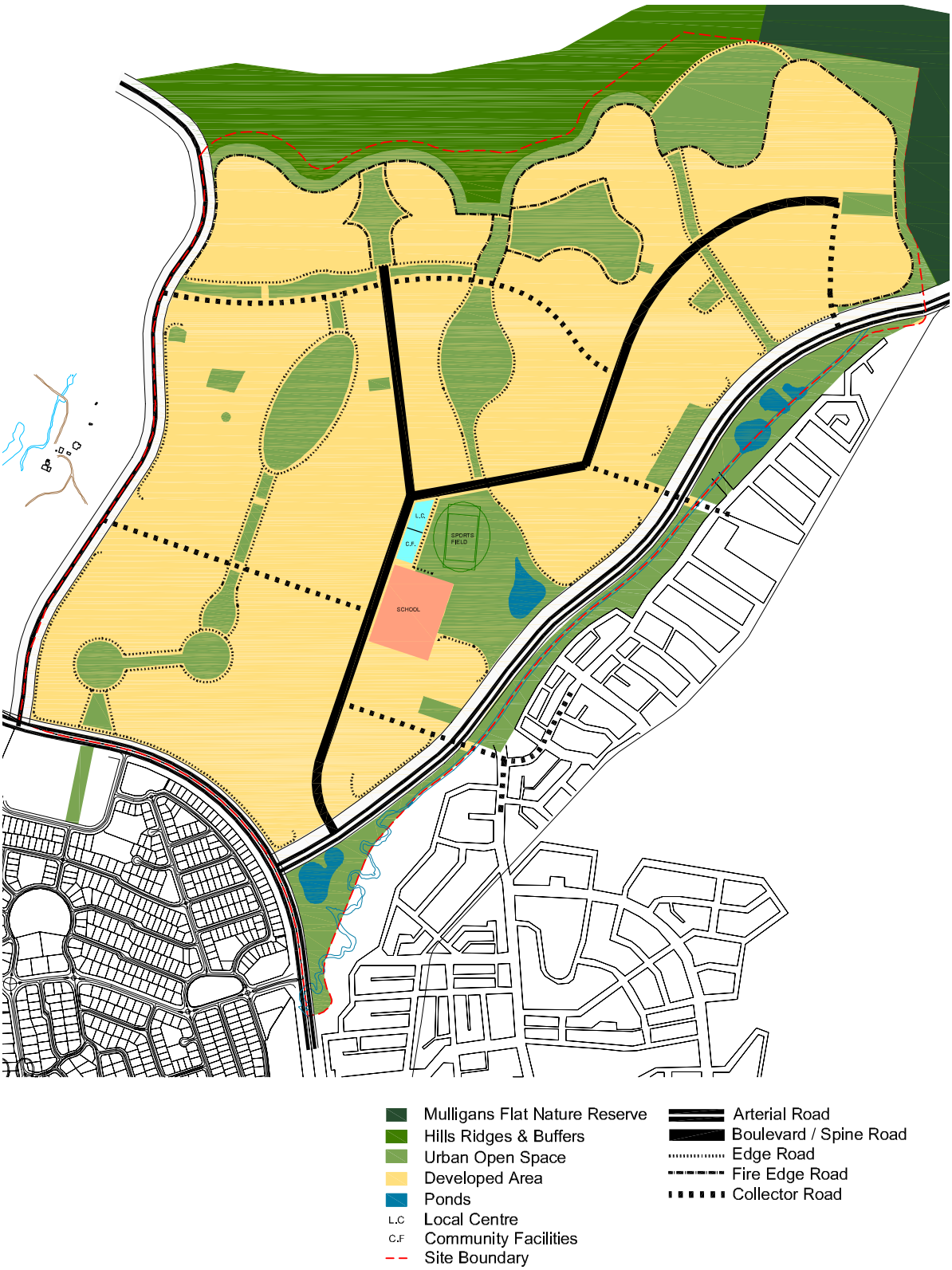


Figure 2.1.3 Concept Plan

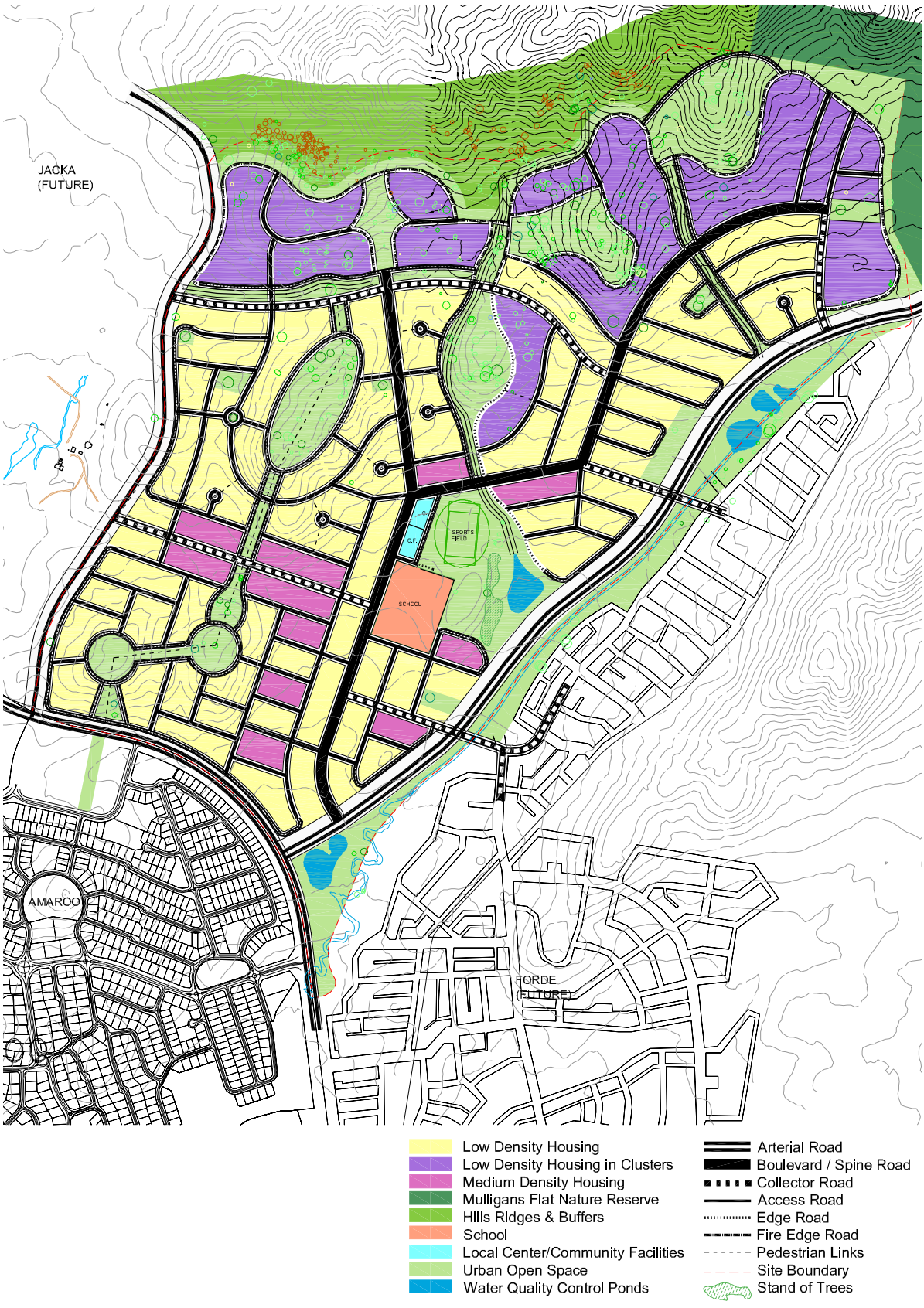


Figure 2.1.4 Indicative Sub-Division Plan

2.2 LAND BALANCE SHEET

The total area of development including roads and infrastructure is 76% of the total site area. The open space area, not including road verges, is 24% of the total site area. The following table shows the potential total number of dwellings achievable under the Indicative Sub-Division Plan (Fig 2.1.4). Depending on the lot sizes of the low density housing and the mix of low and medium density housing, it may be possible to realise close to the target number of dwellings in the North Gungahlin Structure Plan Review. Through the concept planning work, a third housing type, Low Density Housing in Clusters, was identified for use on the higher, steeper slopes in the northern parts of the site, where the presence of many good quality existing trees makes regular detached housing difficult to achieve. Under the Concept Plan, the total number of dwellings in Bonner can vary, depending on the final mix of medium and low-density sections.

OVERALL CONCEPT PLAN LAND BALANCE SHEET

Land Use	Area (ha)	% of Total Site Area
Housing	120.6	46.9%
School	3.2	1.2%
Local Centre & Community Facilites	0.6	0.2%
Roads	71.2	27.7%
Total Development Area	195.6	76.0%
Open Space	61.4	24.0%
Total Site Area*	**257.0**	**100%**

*Area of site calculated using the centre line of Jacka Road, a line 30m north of the fire edge road, the centre line of eastern creek/floodway and the property line at Horse Park Drive.

HOUSING LAND BALANCE SHEET

Housing Type	Area (ha)	No. of Dwellings
Medium Density 40 D/Ha (250m2 Block)	10.1	404
Low Density 20 D/Ha (500m2 Block)	74.8	1496
Low Density Housing in Clusters 10 D/Ha	35.7	357
Total	**120.6**	**2257**

Figure 2.2.1 Land Balance Plan

2.3 INFRASTRUCTURE

2.3.1 Water Supply

Bonner lies across two water pressure zones with the upper limit of the high zone (TWL 715) controlling the northern limit of the suburb (along with extreme slopes).

The Elmgrove 1 reservoir which services the intermediate zone (TWL 685) will be located just north of the northern edge road on ground at RL 680 (see Figure 2.3.1).
From previous work on the Structure Plan, a 750 diameter bulk supply main will feed this reservoir from Horse Park Drive. A proposed route is shown on Figure 2.3.1. The bulk supply main will follow the open space corridors associated with the stormwater floodway system. As these open space corridors have edge roads, the bulk supply main should be located near these roads to allow ActewAGL to have relatively easy access. At the same time there is significant space for ActewAGL to undertake any major maintenance works. The final location of this main will have to be co-ordinated with the floodways, trunk sewers and tree planting.

From the Elmgrove 1 reservoir, a pump station will deliver water to the high zone reservoir at Elmgrove 2. This reservoir is at a base level of about 710 and will be located in steep terrain further north from the northern edge road.

Figure 2.3.1 provides a suggested arrangement of the reticulation ring main through the suburb.

Figure 2.3.1 Water Supply Concept Plan

2.3.2 Sewer

The sewer concept design is relatively straight forward with the reticulation system generally following the existing watercourses as shown in Figure 2.3.2.

With Bonner being at the top of the whole sewer network, pipe sizes for both the reticulation and trunk systems will be relatively small. All blocks can be serviced by gravity sewers and no pumping is required.

The existing trunk sewer is already at the lower point in the main Bonner catchment however there is no trunk sewer in the Horse Park Wetlands catchment, which will delay development of the western side of Bonner. The final route of this sewer through the Wetlands will require careful environmental investigation to understand how the surface hydrolodgy and the geo-hydrolodgy interrelates with the ecology. The construction of this trunk sewer may not commence until the suburb of Jacka is ready for development.

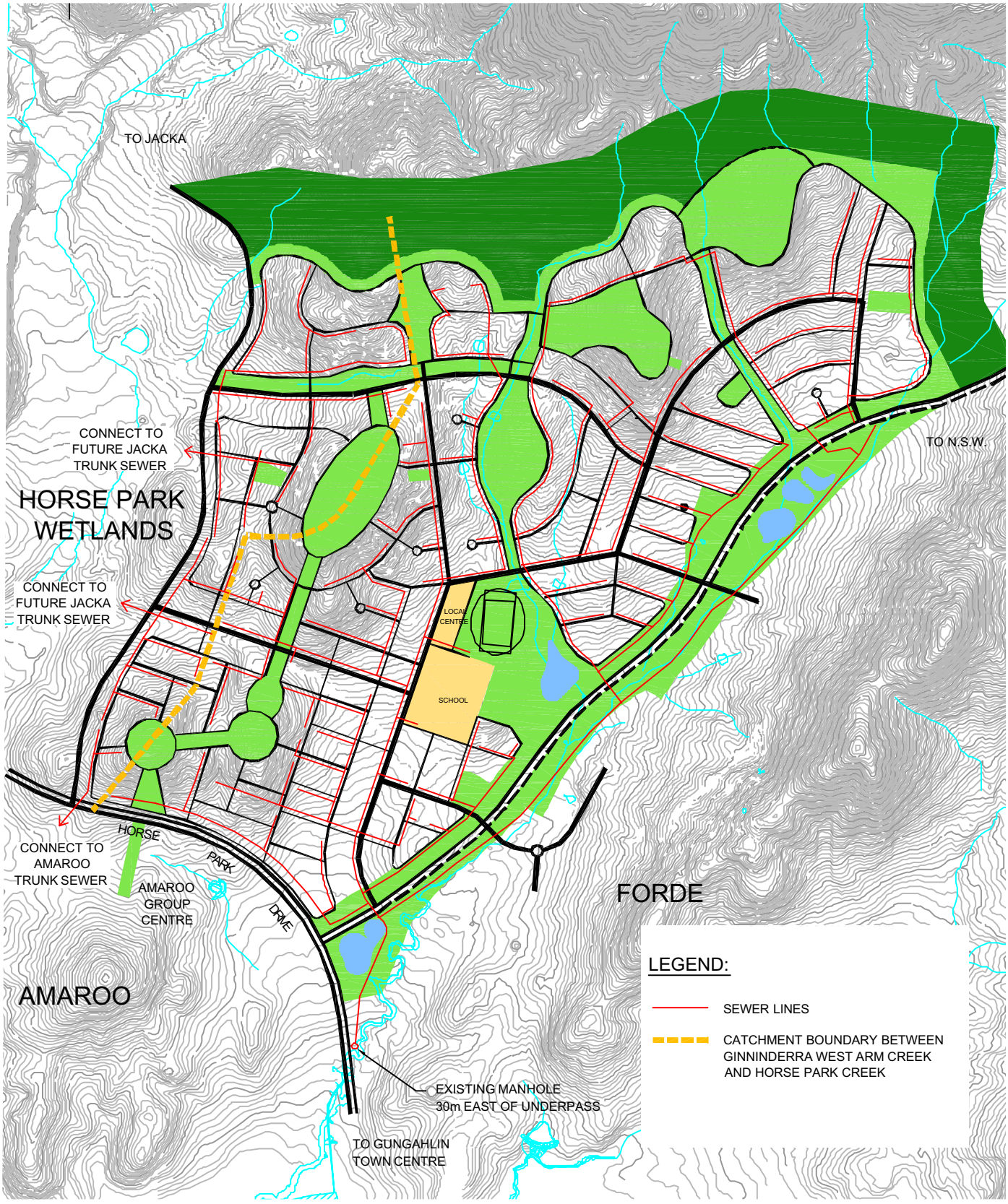


Figure 2.3.2 Sewer Concept Plan

2.3.3 Stormwater

Stormwater design must be undertaken with consideration of water sensitive urban design (WSUD) principles. Therefore the design must consider: -

- Flood or peak flow control.
- Water quality.
- Promotion of riparian or natural systems.
- Durable, low maintenance systems.
- Conservation and reuse.

Some of these principles can be in conflict so a balance must be found during the design process.

The concept design for Bonner has been undertaken with these principles and the resulting Stormwater Concept Plan is shown in Figure 2.3.3

Peak Flow Control

- Pipe systems will be designed for the 1:5 AEP storm event.
- Grass swales, fail-safe overland flow paths and floodways will be designed for the 1:100 AEP storm events
- Two ponds will be used to retard the 1:100 AEP developed peak flows back to the levels under the current undeveloped situation.
- Roads and laneways will generally be used to convey overland flows up to about 2 cum/sec at which stage there will be concerns with run-off entering properties or stability risks (i.e. Vd exceeds 0.4). At this point, overland flows must be directed to dedicated floodways.
- **The grass swales will have a capacity of 100 to 220 l/s depending on grades. This will allow about 150 metres of road and adjoining residential blocks to be drained.**

- To control the shape and grades in the swale it is proposed that the road contractor construct the concrete driveways. To provide opportunities for good ESD housing (i.e. with garages on the southern or western sides of the house) driveways should be located at the southern end of blocks in the case of north-south streets and at the western end of blocks in the case of east-west streets.

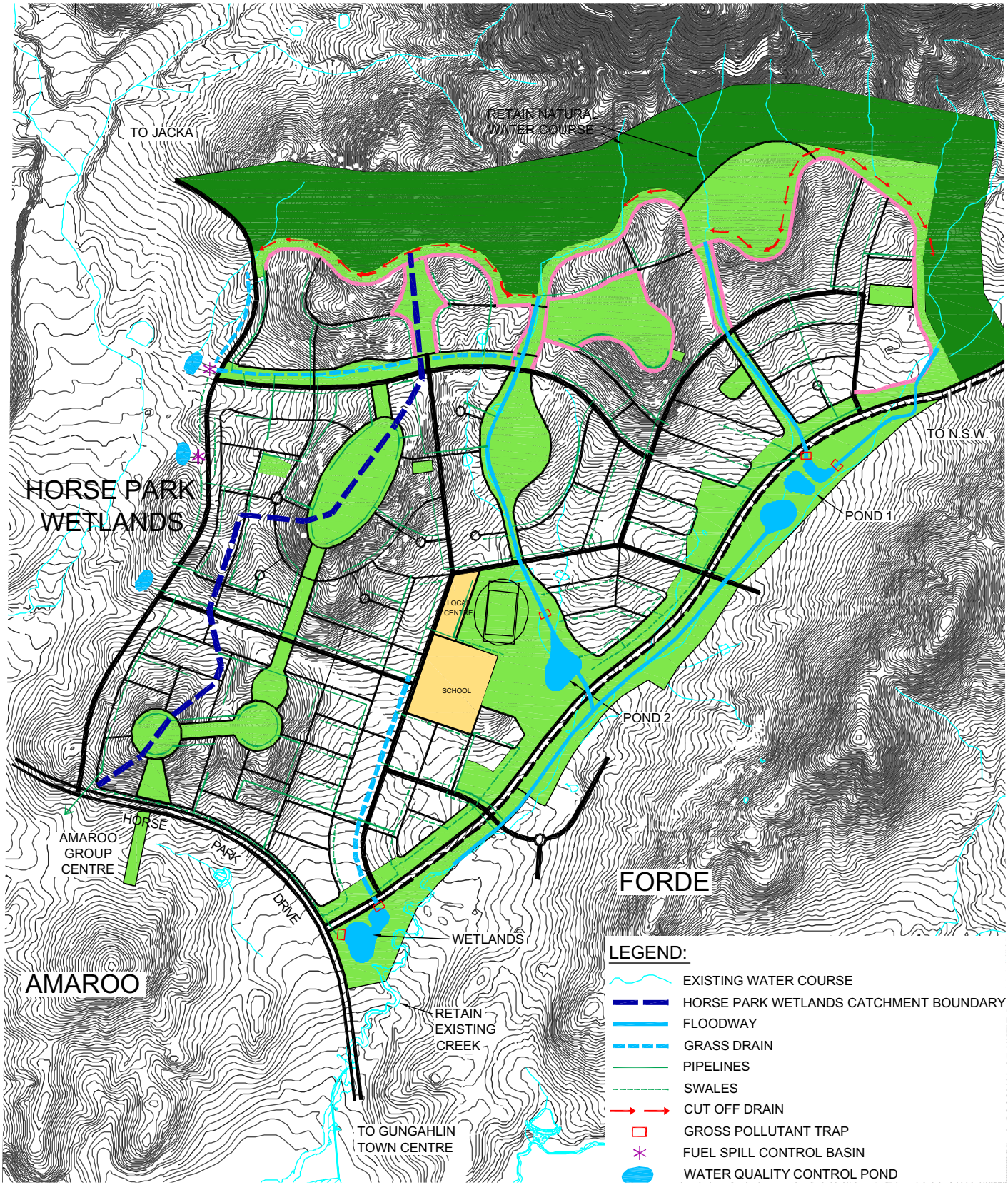


Figure 2.3.3 Stormwater Concept Plan

Water Quality

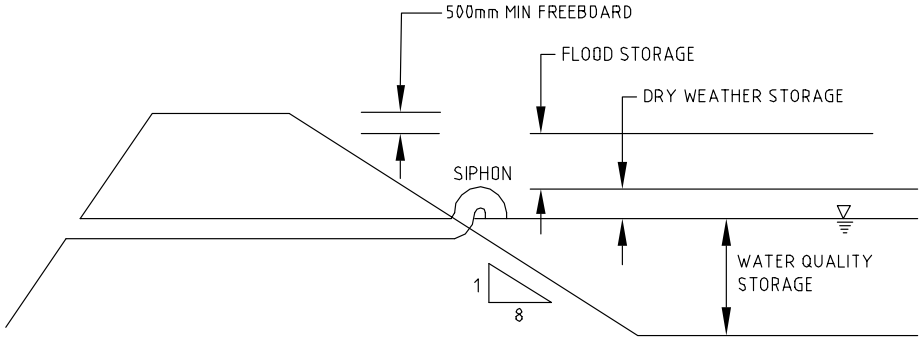
Water Quality **can** be tackled on two fronts as follows: -

- Out-source water quality control provided in the form of grass swales where the terrain is suitable (i.e. slopes are generally less than 5%). These swales grassed and trees planted along the sides but none in the drain invert. The trees should be able to take advantage of the concentration of run-off.
- The more traditional use of water quality control ponds which are generally located off the line of the main floodway so that the same water is not being treated a number of times and thereby reducing the efficiency of the system. There are large ponds in the main catchment plus a wetland arrangement on a tributary at the bottom of this catchment. Gross pollutant traps will be located on the up-stream side of these ponds and wetlands.

On the small sub catchments discharging into the Horse Park Wetlands there will also be smaller wetland control systems. These wetlands may be ephemeral systems in keeping with the general nature of the existing environment. In recognition of the sensitivity of the Horsepark Wetlands, the use of RTA style 20,000 litre fuel spill basins may be warranted with these wetland ponds. In addition the use of a proprietary GPT model such as the vortex type CDS units or similar will provide superior water quality outcomes to the traditional DUS type GPT. The Horsepark Wetlands will be the subject of a separate study which amongst other things will confirm the need for fuel spill basins.

Promotion of riparian or natural systems

The natural stream system tends to be ephemeral in nature, i.e. the creeks flow only during and just after storms before drying out. The proposed stormwater system must maintain this arrangement for the western catchment which drains to the Horse Park Wetlands by storing the additional dry weather base flow which is generated when a catchment is urbanised due to irrigation, car washing etc. For the remaining bulk of the estate it would be possible to store this dry weather base flow in the two ponds and downstream wetland but given the size of these flows it will be necessary to tip this stored base flow out via a siphon system (see sketch below).



There are opportunities to promote a riparian environment at the far southern end of the catchment where the existing erosion scarred gully flattens out into a meandering creek (often dry) before again joining a lined floodway to pass through the existing underpass at Horse Park Drive. The proposed floodway profile allows this to occur.

Low Maintenance

The current approach to the design of grass lined floodways is providing water velocities kept under 2 m/s through flat grades and masonry drop structures.

The use of suburban swale systems have in the past incurred maintenance problems but as previously discussed these issues can be controlled by: -

- Careful location e.g. the low side of the road reserve.
- Early installation of driveways.
- Avoiding planting trees in the invert.
- Controlling vehicles.

2.3.4 Other Services

Power Supply

Actew AGL has the capacity to supply power to Bonner from its existing distribution mains to the south. Future distribution and reticulation mains will be located in the proposed road reservations, generally as shared trenches with gas and communications. The proposed positions of these shared trenches are shown on the typical road cross sections in section 2.3.5.

There is an existing rural overhead power supply running across the southern part of the suburb to service properties around the Horse Park Wetlands/Jacka Valley. This supply must be maintained as the suburb is developed.

Street Lighting

All pedestrian lighting on streets will be provided using street lighting which illuminates the cycle ways and paved paths at the street edge and verge.

Street lighting is to be designed in accordance with AS 1158. In addition street lighting columns, fittings and fixtures shall comply with DUS guidelines and requirements.

Gas

Gas supply will utilize the same shared trench system as the above mentioned Power Supply.

Communications

Communications will also use the same service corridor network as gas and electricity. In addition, Telstra will require a 700 to 1000 square metre block in the north west part of Bonner near the Jacka Distributor for a switching and control centre.

2.3.5 Traffic and Access

Traffic Assessment

The road network and hierarchy has been designed to provide accessibility, connectivity and legibility. The layout of the internal road network has been designed to encourage and direct internal traffic to the arterial and sub arterial road system, thereby helping to reduce the traffic volumes on other internal roads. The collector roads and Boulevard provide good coverage with the vast majority of residents being within 400metres of a bus route. A combination of on road cycle lanes and off road shared paths provides for pedestrians and cyclists.

Road Network

Hierarchy

The Road Hierarchy is illustrated in Figure 2.3.4. The main features of the road system are: -

- Generally, the suburb is bounded by arterial and sub-arterial roads intended to draw commuters traffic quickly away from the local suburban streets.
- There are no residential areas segregated from the bulk of the suburb by an arterial road now that the sub-arterial link to Jacka has been moved further west.
- The northern edge of the suburb will be controlled by a special bushfire edge road.
- A 'boulevard' passing roughly through the middle of the suburb provides the main internal suburb link.
- Coming off this boulevard are a couple of Collector Roads which in turn feed the local access streets.

Generally the road hierarchy will require a motorist to only make 3 turns to reach a destination. This suggests good legibility.

- All roads have been planned to allow 12.5 metre minimum turning radius

Traffic Flows

Figure 2.3.5 provides initial estimates of traffic flow, expressed in vehicles per day, on key roads within the suburb. It is assumed that each dwelling will generate 10 trips per day.

The suburban road network has been arranged to encourage commuter traffic to move to the external road network rather than use the internal boulevard/spine road system.

Only on the lower part of the **b**oulevard do the traffic volumes climb above the 6,000 vehicle per day mark, which is the limit for direct access to individual residential properties off a public street.

The volumes near the Local Centre range from 2,000 to 4,000 vehicles per day, which is similar to volumes on Tillyard Drive near the mixed business shop, which suggests that the proposed site for the Local Centre can be viable.

The assumed cross border flows do not include vehicle numbers from the possible 5,000 population development near Sutton.

The southern connection to Forde is required to provide access to the Bonner Primary School and is predicted to carry about 1500 vehicles per day. This prediction assumes that there will be suitable planning and intersection controls within Bonner so that this route does not become an attractive alternative to Horse Park Drive.

Intersection Controls

Figure 2.3.6 outlines proposed intersection controls with the key features being: -

- Signalised intersections with Horse Park Drive.
- The intersection of the Boulevard with the westward Collector Road in front of the school should be signalised to allow a safe crossing for children. There will also be bus stops on the departure sides of this intersection.
- Roundabouts at strategic locations along the Boulevard and Collector roads particularly at four-way intersections and spaced to control excessive speed.

Other local access street intersections should be uncontrolled.

Pedestrian and Cycleway Networks

Figure 2.3.7 provides an outline of potential bicycle routes within the estate. Sufficient width has been included in the road corridor to allow for on road cycle lanes on arterial, boulevard and collector roads. Potentially there should be: -

- Provision for on road cycle lanes on all arterial, boulevard and collector roads, however the inclusion of such facilities will be subject to final design analysis.
- Off road shared paths, which follow Horse Park Drive and the new Gundaroo Road.
- Off road shared paths, which follow the major water courses and flatter open space corridors.

The network of pedestrian and cycle shared paths follows closely the road and corridor network system offering the following advantages:

- Maximum connectivity and access to all points of Bonner including the five precincts, the local mixed use centre and school, playing fields, pocket parks and elevated vantage points
- Maximum connectivity and access from Bonner to Forde, Jacka and the Gungahlin group centre
- Controlled access for pedestrians and cyclists to Mulligans Flat Nature Reserve via the fire edge road
- Interaction of the corridor open spaces with pedestrian and cycle shared ways
- Balance of off road and on road pedestrian and cycle shared ways providing variety and interest to the network

An extension of the Bicentennial National Trail route is provided along the fire edge road, allowing for connections to Mulligans Flat Nature Reserve, Forde, Jacka and Gundaroo Road into NSW.

Public Transport

Bus routes are intended to use the Boulevard and Collector roads. Actual bus routes and the location of bus stops will be determined by ACTION. Possible routes are illustrated in Figure 2.3.8. The proposed routes should: -

- Provide a service for school children in Forde to access their school in Bonner.
- Be within 400 metres of most residents.
- Provide access to the local centre, the Amaroo Group Centre and commuter routes to Gungahlin Town Centre and Civic.
- Provide for easy movement of buses through incorporation of a 12.5 metre turning radius at all intersections along possible bus routes.

Road Cross Sections

Following on from the road hierarchy, Figures 2.3.9 to 2.3.19 provide the typical cross section for each class of road in Bonner. Generally these cross sections follows the requirements of ACTCODE.

There are however some special features such as:

- Swale drains as part of developing water sensitive urban design will be **investigated for** local streets where existing ground slopes do not exceed 5%. Once the existing fall exceeds 5% access to the properties (particularly on the downstream side) starts to become more difficult which may effect the value of the property and the maintenance of the swales. The application of swales will be limited by their hydraulic capacity and the presence of road intersections. The potential locations for swale drains are shown on the Stormwater Concept Plan (Fig. 2.3.3). It is intended to locate the swales on the downstream side of the road with the road pavement falling with the natural slope of the land to the swales. This will allow a good fit with the land and therefore better property access. Locating the swale on the low side of the road should also improve the long-term durability of the grass swale because the adjoining downstream property owners are less likely to damage the system through inappropriate actions, such as parking cars or re-landscaping their verge, knowing that this may lead to more run-off entering their properties.
- All Collector roads and higher category roads will be suitable for bus routes.
- The bushfire edge road along the northern interface with the open space will include a 40 metre clear **Inner Asset Protection Zone (IAPZ).** Features of this zone should include low fuel loads (i.e. mown grass and vehicle accessible slopes with a maximum batter slope of 1 in 4). There is also the possibility of locating in the **IAPZ** a fire trail plus a cut off drain to direct run-off from the upstream catchments around the residential areas. The **IAPZ** is required to not only provide a buffer between potential bush fires and the residential properties, but also a shelter and safe operating area for fire crews. The **IAPZ** should be fenced off with a simple rural fence (without barbed wire) to keep private vehicles out of the adjoining Hills Ridges and Buffers areas. Beyond the **IAPZ** there will be an **Outer Asset Protection** Zone including an alternative location for the fire trail .

The realigned Gundaroo Road which forms the eastern boundary of Bonner will only need to be constructed **as a two lane rural road initially but there must be allowance for possible duplication to four lanes should a major** development occur across the border. This route is the only access point to NSW between the Barton and Federal Highways. The future carriageway should lie to the east of the proposed carriageway and space should be allowed for noise control. The length of road between Horse Park Drive and the start of the Boulevard should be constructed as dual carriageways due to traffic volumes and to provide a good level of service which will discourage rat-running through the suburb of Forde. Its eastern edge will form the boundary of the floodway.

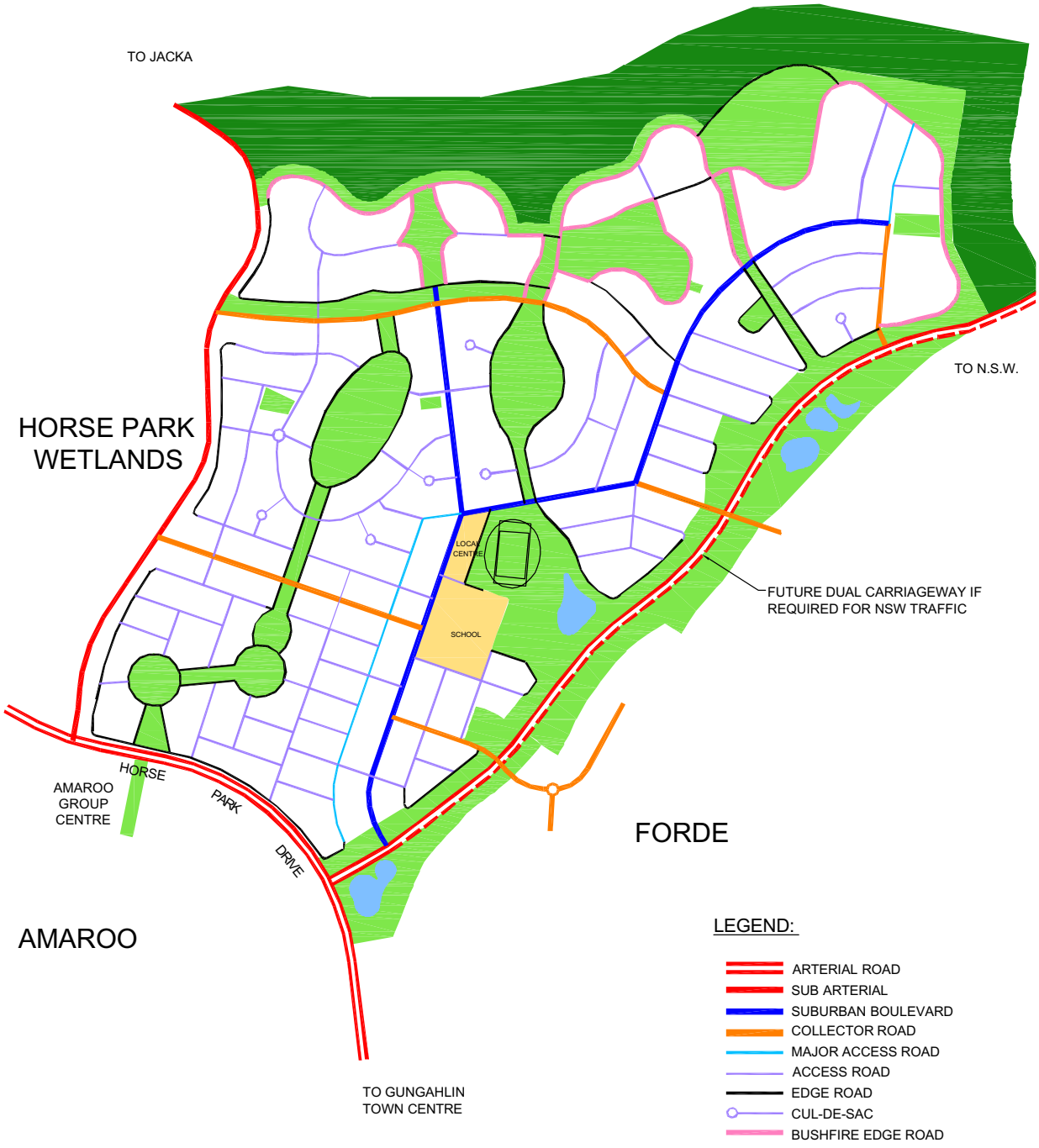


Figure 2.3.4 Road Hierachy

Figure 2.3.5 Estimated Daily Traffic Flows

Figure 2.3.6 Intersection Controls

Figure 2.3.7 Bicycle and Pedestrian Routes and Equestrian Trails

0 500m

Figure 2.3.8 Bus Routes

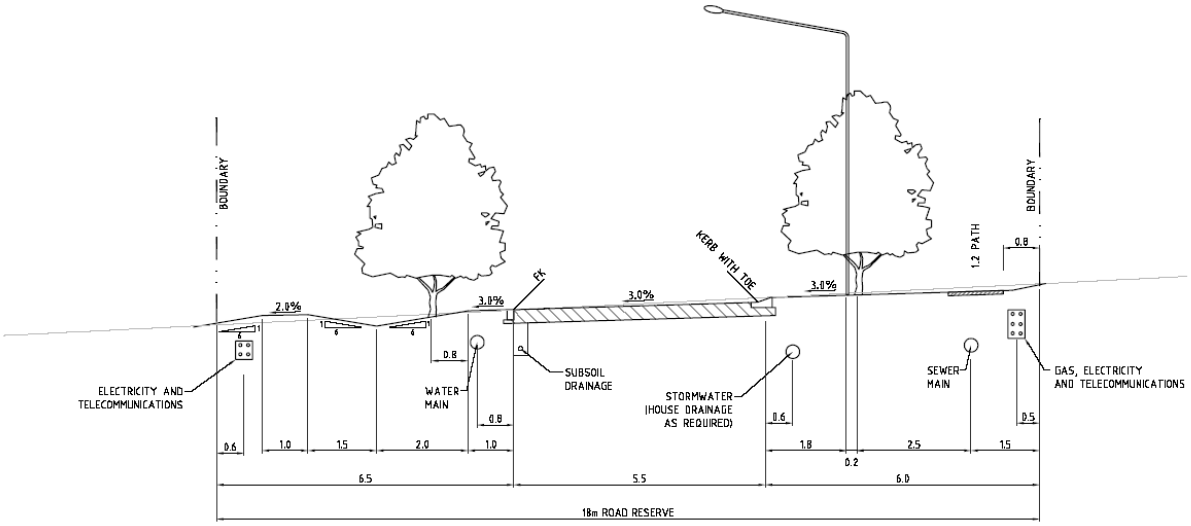


Figure 2.3.9 Typical Section: Access road with swale

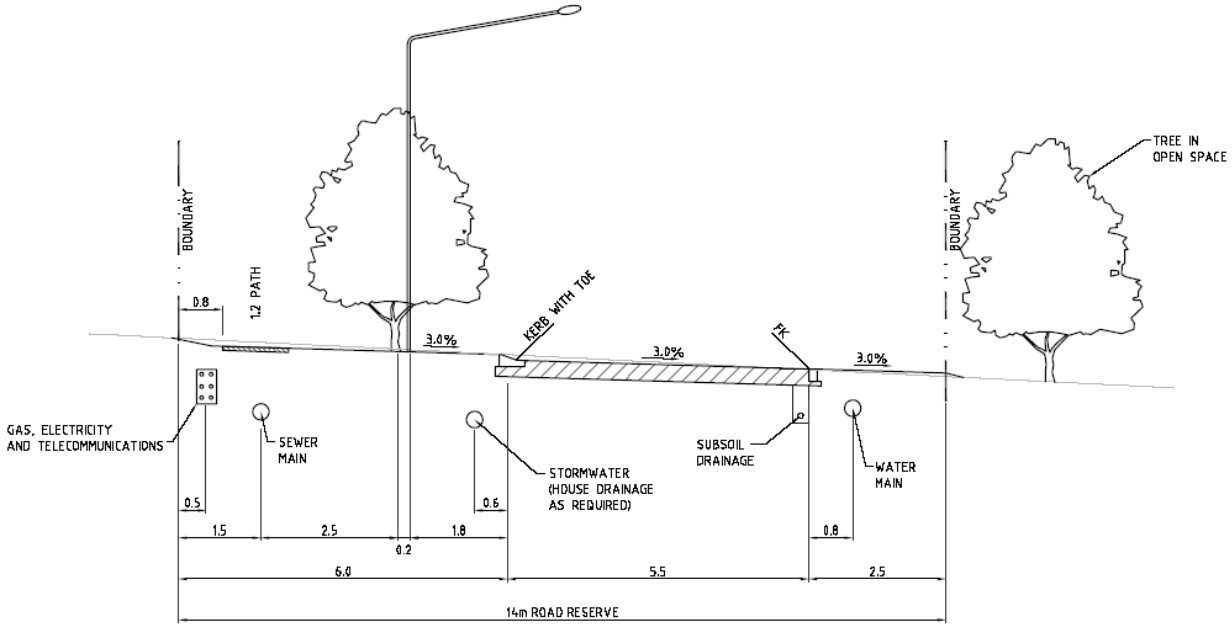


Figure 2.3.12 Typical Section: Edge road

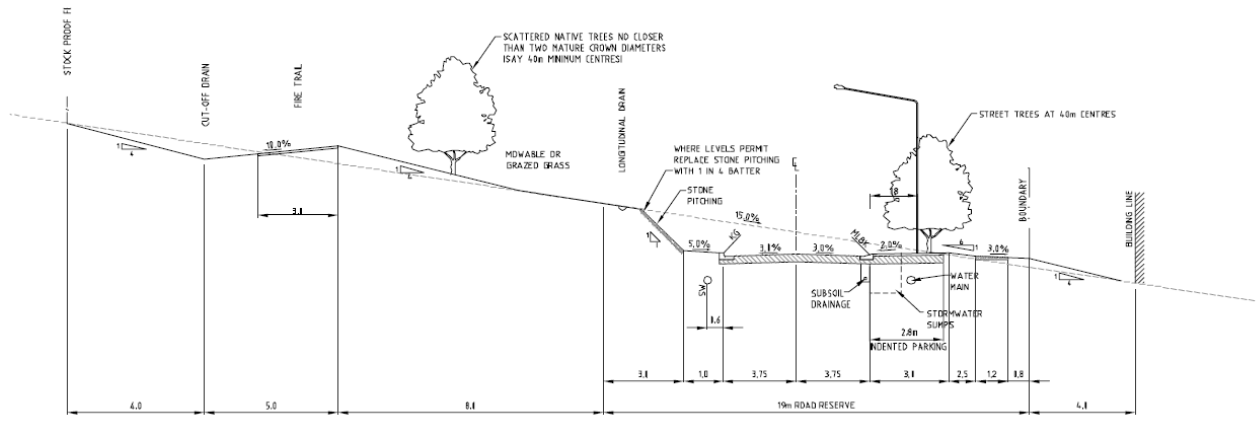


Figure 2.3.15 Typical Section: Bushfire edge road

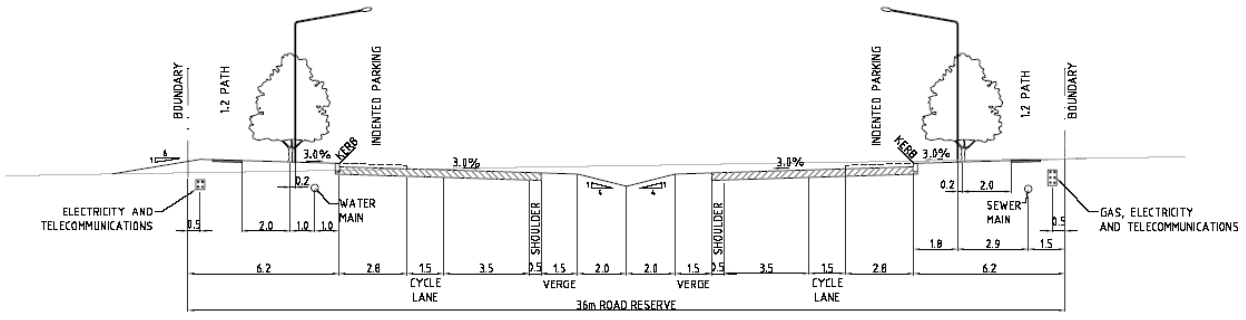


Figure 2.3.16 Typical Section: Suburban boulevard

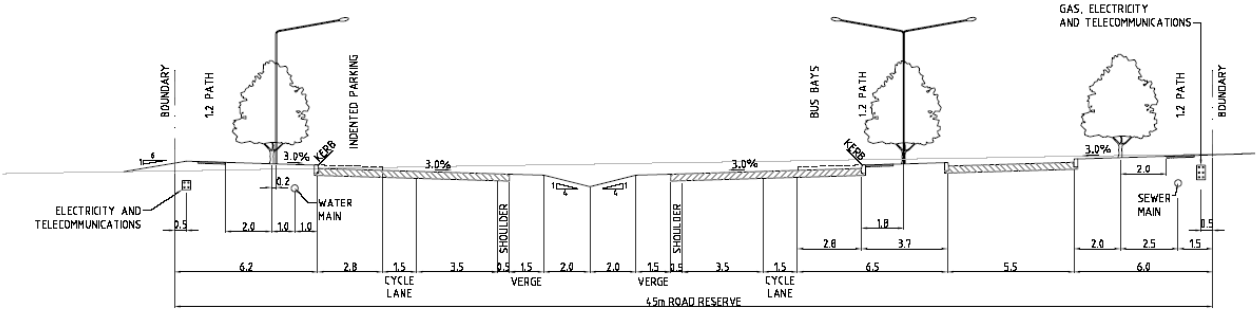


Figure 2.3.17 Typical Section: Suburban boulevard with service road at school

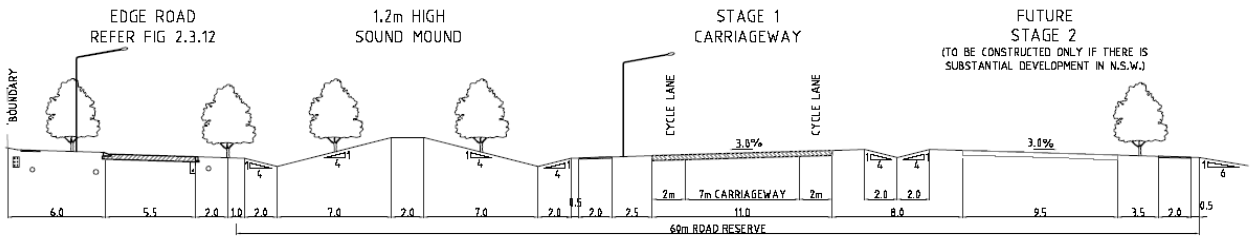


Figure 2.3.18 Typical Section: Parkway arterial (eastern boundary of Bonner)

2.3.6 Bicentennial National Trail

The Bonner Plan includes the opportunity to incorporate the Bicente**nni**a**l** National Trail in the future. The trail would traverse the northern edge of the site using the urban open space within the fire edge road reserve. It could be located in conjunction with a fire trail and cut-off drain.

2.3.7 Bushfire Risk Assessment

An Independent Bushfire Risk Assessment (BRA) has been carried out on the final Concept Plan and Indicative Subdivision layout for Bonner.

For the full report Bushfire Risk Assessment for the Bonner Residential Estate, refer *Bushfire Protection Measures for the Bonner Urban Release Area, ACT, June 2004*, prepared by Conacher Travers, Bushfire and Environmental Consultants and provided at **Appendix C of the background report.**

The BRA recommends that urban development proceed within the study area in accordance with specific controls relating to design and land management regimes set out in the report, the key elements of which are contained in the Important Planning Requirements at Section 2.10 below.

It should be noted that a further BRA will be undertaken at the detail subdivision stage (Estate Development Plan) to refine and confirm the protection measures applicable to the suburb or parts of.

2.3.8 Site History Investigation

A site history investigation was carried out by Maunsell in February 2004. The report and recommendations are included in **Appendix H of the background report.** The purpose of the site history investigation was to identify former uses or occupiers of the site that may have resulted in soil or groundwater contamination. The site history report should be used to determine the scope of future contamination investigations necessary to assess the contamination status of the site.

The site history investigation revealed a number of site activities that could have potentially contaminated the site and/or underlying groundwater as follows:

- On site and off site sheep dips – Arsenic
- Residential dwellings and sheds on site – termiticides or farm chemicals
- Farm dump sites – unknown
- Car dump sites – metals and hydrocarbons
- Grazing/cropping land – herbicides and pesticides

It is expected, based on the findings in this inspection report, that the site presents a low potential for contamination (excluding the sheep dip sites) but this has not been established by intrusive investigations.

A detailed recommendation is included in the Site History Report. In summary however based on the findings of this investigation and preliminary discussions with representatives of Environment ACT, further investigation and testing is recommended. It is recommended that an Environmental Auditor (Contaminated Land) be engaged and testing instigated to determine the quality of the soil, groundwater and stormwater and to determine the extent and nature of remediation that may be required. The recommendation to engage an Environmental Auditor and instigate some testing as part of further investigations is consistent with correspondence and discussions with Environment ACT as well as National Environment Protection Measures (NEPM) 1999 guidelines.

2.3.9 Heritage Study

The cultural heritage scoping study for the proposed sub-division area of Bonner included a search of the ACT Heritage Unit site database only and field work including an on-site walk with local aboriginal representative groups. The search indicated that there have been five Indigenous cultural heritage sites and two non Indigenous heritage sites previously identified within the bounds of the Bonner area. The table below provides the summary details for these sites.

Previously Identified Indigenous sites

Site Name	Code ID	Grid Reference (WGS 84)	Description
C5/3	644	695159 6107256	2 quartz flakes 1 chert flake. Salvaged (Saunders 1995)
C5/9	650	695636 6107311	Scarred tree
2026 (Bindon)	1080	694625 6106802	Isolated artefact
HP32	1107	694419 6107454	3 artefacts on summit of knoll, 300m from wetlands
1514	679	694036 6106812	Two grey chert flakes

Previously Identified Non Indigenous sites

Site Name	Code ID	Grid Reference (WGS 84)	Description
1465	785	695302 6107087	3 rusty ploughs
1471	791	695224 6107933	Fence post

The fieldwork component of the cultural heritage assessment for the Bonner project was undertaken on the 1st and 2nd of April 2004.

In the course of the field survey, the team was able to confirm and record three of the Indigenous heritage sites (C5/9, HP32 and 1514) and one of the non Indigenous heritage sites (1465). It should be noted that one of the previously identified Indigenous heritage sites that was not confirmed (C5/3) has been previously salvaged.

In addition, the field team identified a total of five new Indigenous heritage sites and Two PAD areas. These sites were reported to **the Authority** as per the scope of works for the cultural assessment. The table below provides the basic details for these.

Additional sites identified during the present study

Site Name	Grid Reference	Description
BPAD1	695770 6107160	Elevated, level rise (30m x 30m) on east margins of creek line
BIF1	695845 6107280	Edge ground axe on west edge of creek
BAS1	696220 6107640	4 artefacts on erosion embankment on east margins of creek
BIF2	695850 6107660	Isolated artefact on erosion scald, 100m west of creek
BPAD2	695210 6106985	Flat summit of small knoll, overlooking valley
BAS2	695080 6106585	10 artefacts spread across the east slopes of a small rise, on the west margins of a creek line
BAS3	695030 6106700	Approximately 20 artefact on a small rise (20m x 15m) 150m east of the Horse park wetlands

The Concept Plan does not show each of the PAD sites conserved. However, it does allow for the future conservation of individual PAD sites should future investigations warrant this.

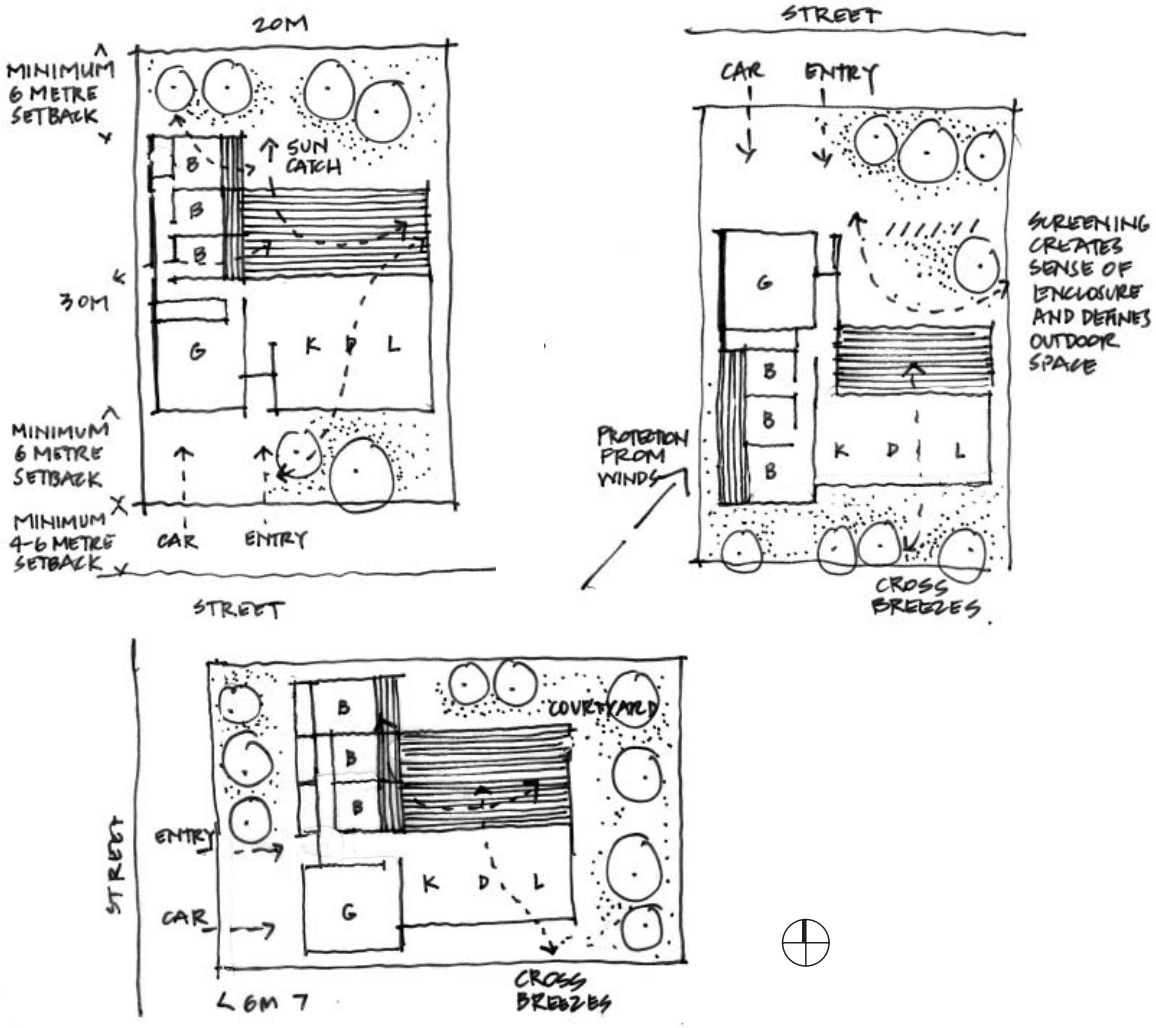
The scarred tree has been assessed based on available information and consultation with the local aboriginal groups. This study was prepared for ACTPLA as part of the verification of the Concept Plan. The master plan allows for the conservation of the scarred tree in open space. Future investigation of the tree will need to be carried out to determine if any additional conservation is warranted.

2.4 HOUSING TYPES

2.4.1 Standard (Low Density) Housing

Typically this type of housing is a free standing single or double storey building with sufficient surrounding landscape providing useable outdoor living space and access from front to back either side of the block

- 500 to 600 m^2 blocks, typical
- North/south or east/west facing blocks
- Block size and dimensions allow house to rotate on block to achieve optimum solar orientation ie living room and associated private outdoor space facing north
- Typically garage access from the address street, except on the Boulevard south of the school, where vehicle access must be provided from a rear lane
- Landscaping of courtyards front and back lends to the overall landscape character of streets
- Garbage collection at front address street. Temporary storage can be incorporated in front fence detail
- Services provided either from the address street, rear boundary easement or rear lane

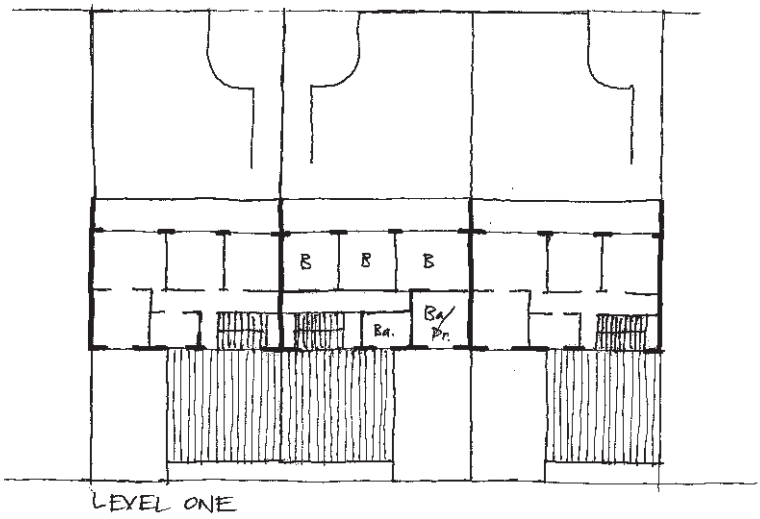


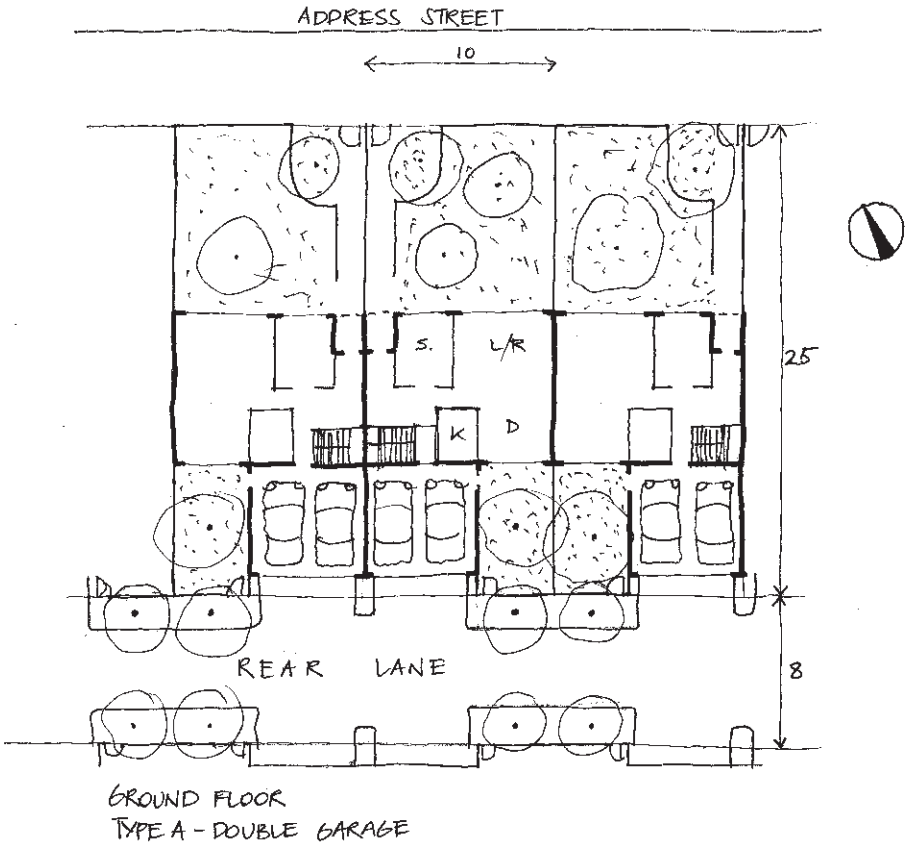
2.4.2 Medium Density Housing

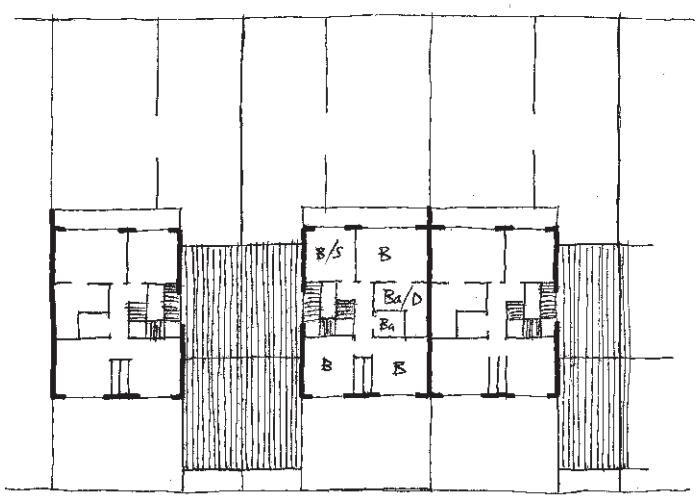
Medium density housing in Bonner is generally envisaged as two storey townhouse development providing front and/or back landscaped yards, parking generally accessed from rear lanes, but in some instances accessed from the address street and rear lane.

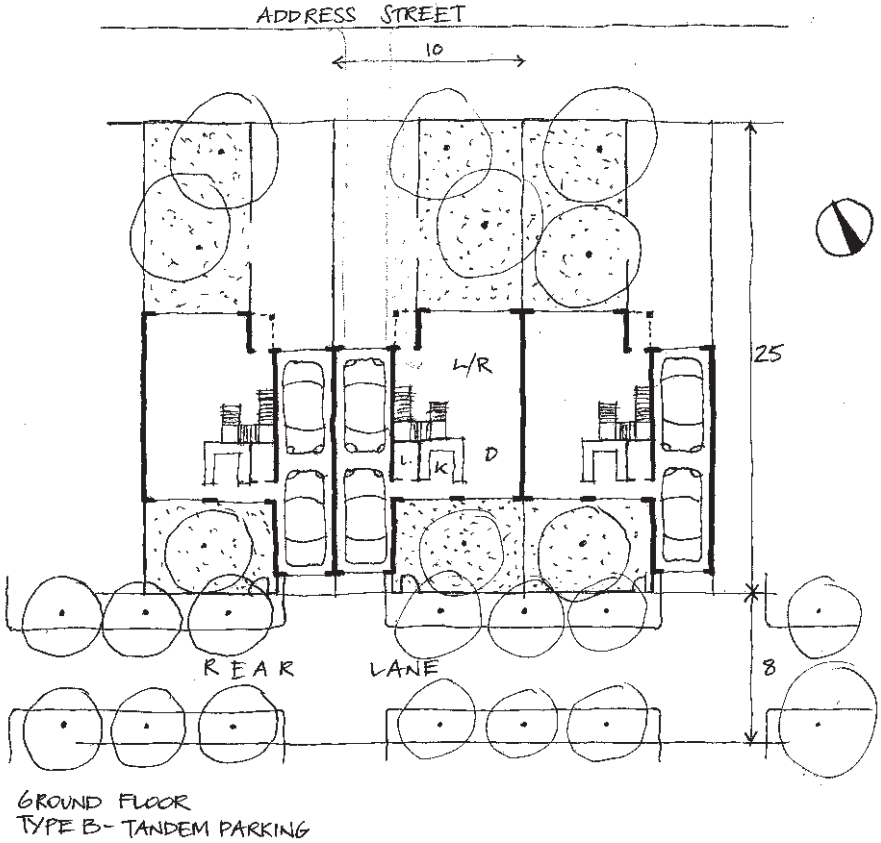
- 250 m^2 blocks, typical
- Generally proposed for use on north/ south facing blocks to achieve optimal ESD performance
- Block size, dimensions and building configuration allow living room and associated private outdoor spaces to face north
- Blocks wide enough for either 2 x car garaging or end-on-end garaging
- Landscaping of courtyards front and back lends to the overall landscape character of streets
- Garbage collection at front address street to avoid over-scaling rear lanes to accommodate garbage trucks. Temporary storage can be incorporated in front fence detail
- Services provided either from the address street or rear lane.

Further details of the proposed strategy for providing medium density housing in Bonner are provided in Section 2.8 below.









2.4.3 Low Density Housing in Clusters

Typically, this housing type includes 8 to 12 residential dwellings of varying sizes on a site of approximately 1 hectare, served by a common access road and clustered around a landscaped open space. The structures, either as individual dwellings or in groups of connected units, are located in response to site specific conditions and to:

- Retain existing trees on site and maximise open space and habitat,
- Reduce overall building and road footprint as compared to standard detached housing
- Allow sharing of some facilities between residents eg internet services and onsite recovery of grey water for purposes such as flushing toilets and garden irrigation.
- Water from roofs can be collected for reuse. Water run-off from the road surface is absorbed at the roadside.
- Average site area of 1000 m^2 per dwelling, typical
- Option to cluster buildings to reduce overall environmental and visual impacts
- Large site area and multiple buildings allow architectural designed housing to protect significant trees, optimise ESD performance and maximise fire hazard protection zone (hpz)
- Landscaping of courtyards is restricted to within the hpz limits. The remaining open space is treated as managed open woodland grassland

2.5 OPEN SPACE

2.5.1 Mulligans Flat Nature Reserve

Mulligans Flat Nature Reserve forms the north-eastern edge of Bonner. It functions as informal public open space with controlled access, i.e. formed trails.

A bush fire edge road separates the northern and northeastern edges of Bonner from the boundaries of Mulligans Flat Nature Reserve and the Hills, Ridges and Buffers areas described below.

2.5.2 Corridors and Floodways

These spaces will be managed as informal public open spaces with parks and corridors providing informal passive recreation opportunities. Circulation through these spaces is by 2.5 metre shared pathways linking precincts and providing access to parks with play and exercise equipment, informal rest and picnic areas, look outs and viewing platforms. Vehicle access and handicapped access to the elevated vantage points is provided via the road network system. The typical landscape treatment is informally arranged native trees and grasses with limited managed grassed areas for public use.

2.5.3 Sportsfield, Playgrounds and Pocket Parks

These spaces will be managed as formal public open spaces: parks providing highly managed open space for active and passive recreation opportunities. The major playground and playing field are located adjacent to the Bonner Local Centre, Community Facilities and primary school allowing multi use and maximum program possibilities. Pocket parks provide local amenity linked to the larger network of open space opportunities via the shared pathways and street networks.

2.5.4 Other Hills, Ridges and Buffer Areas

These areas are currently managed by rural lessees and the land is used mainly for grazing. Public access is not permitted due to the presence of farm stock animals.

2.5.5 Streetscape

Key aspects of the proposed streetscape treatments for Bonner include:

Urban Design

- A coherent street structure is provided that has an identifiable hierarchy allowing easy recognition of location and sense of place within Bonner.
- The Boulevard/Spine Road system and collector roads function as speciality streets distinguishing the main road system of Bonner from the arterial road system.
- A strong sense of place and orientation is achieved by aligning sections of the Boulevard with topographical features such as Black Mountain and Mount Ainslie in the distance and at the local scale, convergence of the Boulevard at the Local Centre and the alignment of streets with local parks, high points and major trees to be retained.
- Vegetated drain swales are incorporated into the street verges and or median for stormwater control and management where slopes and area requirements allow.
- Private residential gardens are encouraged to contribute to the general amenity of the streetscape

Street Trees

- The selection of street tree species will provide variety of street character and identity. Major linking streets are proposed to be planted with predominately exotic tree species, to contrast with local and edge streets that are to be predominantly planted with native species
- The trees on the major streets are to be generally arranged in a formal manner while trees on the local and park edge streets are to be informally arranged as driveway access and sight lines permit
- Two or three tree species should dominate the street tree planting of a neighbourhood, supplemented with one or two complimentary species to provide variety and interest

Figure 2.5.1 Open Space

- Spacing of trees should take into account solar access requirements without forgoing the intended streetscape patterning. Spacing and alignment of trees will depend upon road alignment and adjacent land use and should strive to achieve 1 to 2 trees per block
- Where Australian native plants are to be used, preference is given to the use of endemic species

Potential Street Tree Species

When viewed from elevated vantage points the streetscape and street hierarchy should be clearly visible with:

- exotic species along the Boulevard and Collector roads contrasting with the surrounding native street trees of the local and park edge roads. The Boulevard is intended as a major pedestrian access way connecting the precincts with paths and on road cycle lanes
- the treatment of local streets is intended to foster local character and identity by using one or two main species and accentuating with one or two other complementary species
- a mix of exotic and native tree species is appropriate for laneways in medium density housing areas, providing greenery whilst maximising solar access to private courtyards and dwellings to the south. Where possible private garden landscapes should contribute to street amenity
- on the park edge roads and the fire edge road (subject to fire protection requirements) the tree species should be a continuation of the existing tree character of the retained open space adjoining the road.

2.6 OTHER COMMUNITY FACILITIES

2.6.1 Local Primary School

The local primary school site, of 3.2 hectares, is located at the centre of Bonner to also serve Forde, to the east, and a minor catchment from Jacka, to the west. The school site takes advantage of site topography, outlook, solar access, and proximity to the Local Centre, Community Facilities, the playing fields and the adjacent open space corridor.

A slip lane adjacent to the Boulevard at the front of the school separates bus and parent drop-off/pick-up from general traffic, creating a safer environment for school students. The school site has access from four roads, but maintains uninterrupted access to the playing fields without the need to cross a vehicular street. In addition, low and medium density housing, providing community connectivity and passive surveillance, bounds two and half sides of the site.

2.6.2 Local Centre and Community Facilities

The Local Centre is located at the intersection of three boulevard roads connecting the five precincts within Bonner. The Local Centre and associated car parking is adjacent to the local primary school and playing fields allowing a greater range of activities and longer hours of use, thereby supporting a more active community centre would be expected to occur if these facilities were separated. A total combined floor area for these uses of about 1000m² is expected.

2.6.3 Aged Persons' Housing

Figure 2.6.2 shows possible provision for up to 5 hectares of future aged persons' housing. This should be dispersed and integrated with surrounding low and medium density housing, but in close proximity (no more than 400 metres) to the Local Centre, Community Facilities and bus routes and on flat or generally level ground for easy access. Detail requirements are identified at 2.10.E of the Important Planning Requirements.

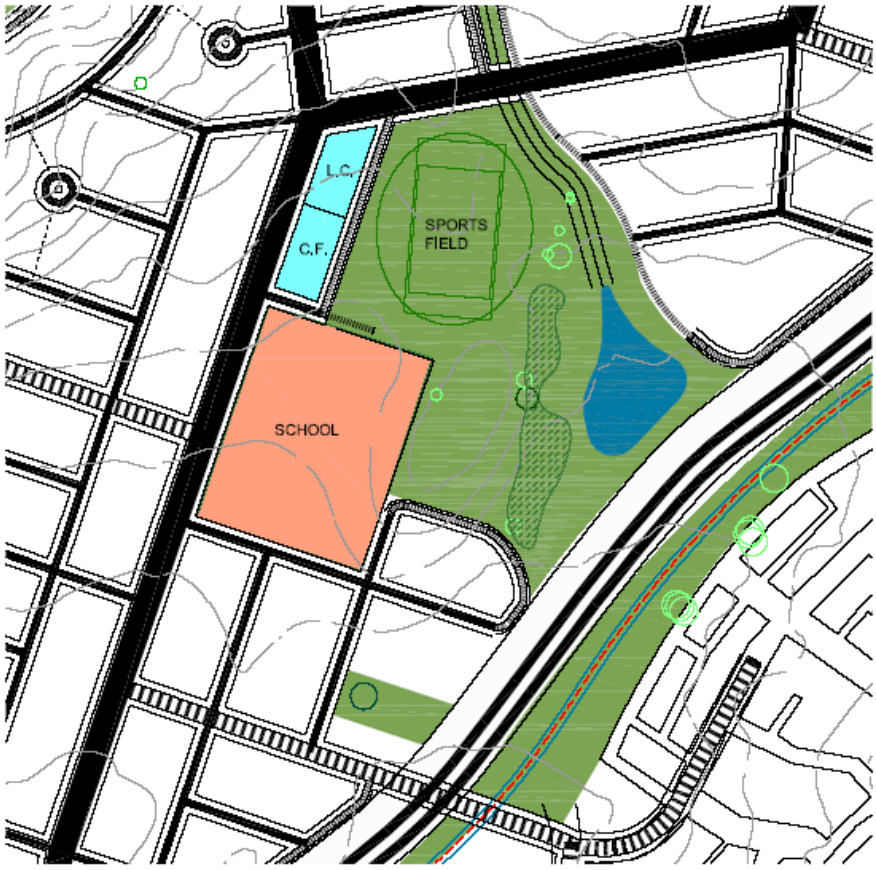


Figure 2.6.1 Local Centre, Community Facilities and School

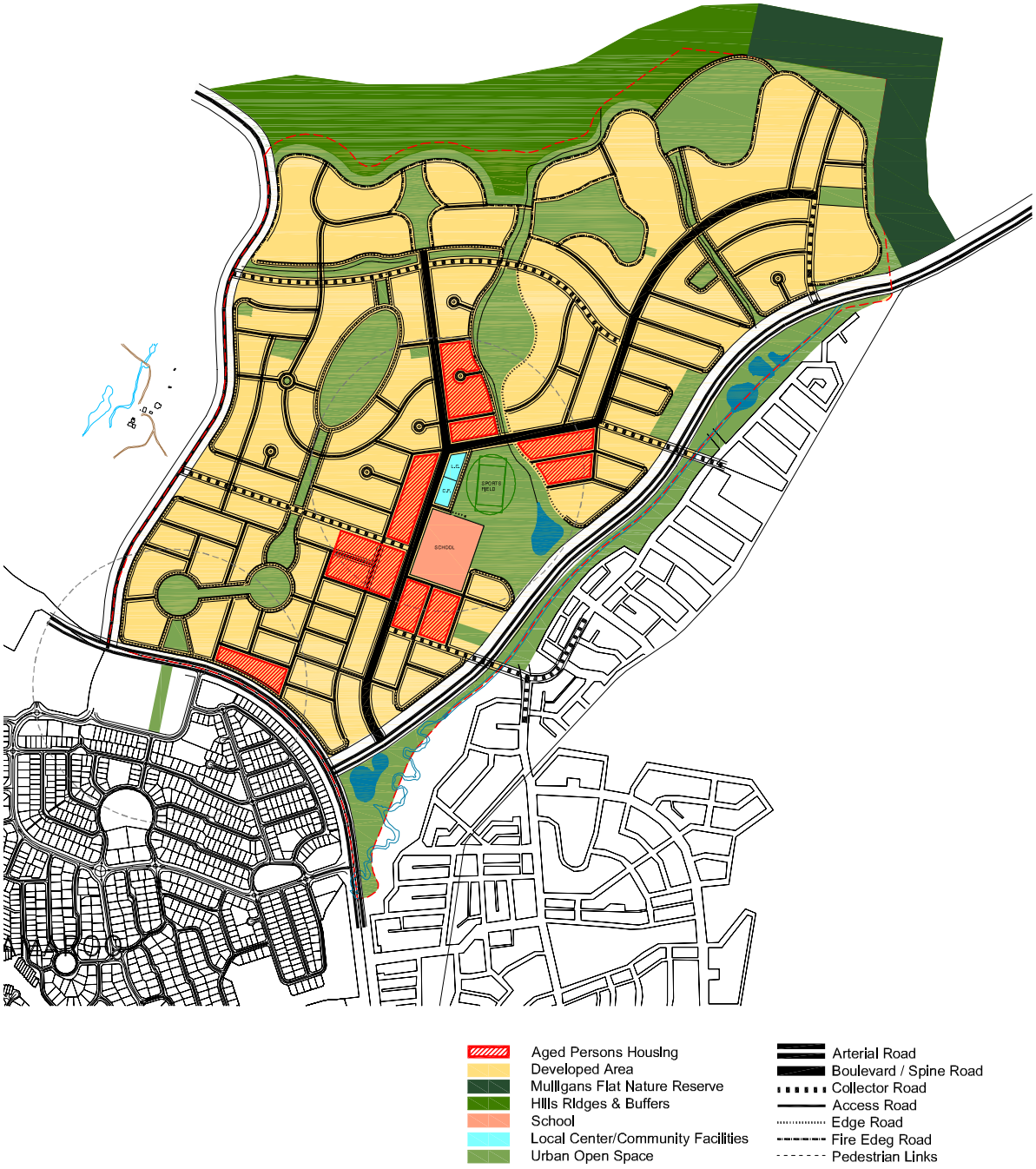


Figure 2.6.2 Aged Persons' Housing

2.7 ENVIRONMENTAL DESIGN

The Concept Plan responds to the environmental conditions of the site in the following ways:

- **Retention** of significant trees by the realignment of the main road structure proposed in the Territory Plan and the selection of high points and ridges, parks and corridors to incorporate an number of existing trees
- The use of road swales (at the verge and/or median) and off-stream wetlands to reduce the effect of stormwater run-off
- Improved water quality for the existing drain line flowing to the Horse Park wetlands, through the use of an open space corridor and managed swale not proposed in the NGSP
- Retaining ecologically sensitive native grass areas not proposed in the NGSP at the northeast corner of the site through the use of low density housing in clusters to maximise native grass open space areas
- The retention of valuable views and vistas by locating parks at hill tops and connecting these vantage points along ridges and corridors
- Use of open space corridors to provide habitat and pedestrian connections to the nature reserves at the north and north-eastern edges of the site
- Effective fire risk control along the northern edge of the site and at the boundary with Mulligans Flat Nature Reserve through the provision of a fire edge road with fire abatement zones.
- Limiting the northern extent of development, defined by the fire edge road, to maximise the area of native woodland regeneration
- **Realignment** of the Jacka sub-arterial road to maximise developable land and maximise the protection of the Horse Park wetland by containing development to the east of the road
- **Realignment** of the new Gundaroo Road to the western edge of the creek between Bonner and Forde, using the embankments to direct urban run-off to stormwater control devices prior to entering the creek

2.8 MEDIUM DENSITY HOUSING

Careful consideration has been given to the layout and configuration of the parts of Bonner where medium density housing is proposed and where housing addresses streets from which driveway access is prohibited due to high traffic volumes. These investigations, which are presented in detail in Appendix G of the background report, serve a number of purposes:

• They illustrate how the Concept Plan works in detail in certain key areas, testing and confirming the viability of the plan

• They allow the direction of detailed design work to be established by generating Important Planning Requirements

An illustrative plan for several sections in the south central neighbourhood of Bonner is presented in Figure 2.8.2. The plan includes detached houses, courtyard houses and row houses. Some sections include rear lanes, which allow:

• vehicular access to blocks which front onto major streets where individual driveways are prohibited

• the inclusion of row housing without rows of double garages on local streets

A three-dimensional representation of a typical medium density section is provided in Figure 2.8.1

Whilst rear lanes in principle offer a number of advantages, it is recognised that they can lead to poor built outcomes if they are not conceived and executed thoughtfully. The illustrative plans embody a number of key design principles:

• keep lanes short and access them from the streets they run parallel to

• make them sufficiently wide to allow trees

• limit the percentage of lane frontage that can be occupied by garages

These design principles are incorporated in the Important Planning Requirements in Section 2.10 below.

Figure 2.8.1 Typical Medium Density Housing Section (trees not shown to highlight building form, open space and street relationships)

Figure 2.8.2 Illustrative Housing Plan in Medium Density Precinct

2.9 STAGING

A possible staging plan is shown in Figure 2.9.1. The proposed staging is based around hydraulic catchment as follows: -

- Stage 1 – The low or downstream catchment which is close to existing sewer lines and Horse Park Drive. Only relatively short sections of floodway need to be constructed. Also in this stage it is proposed to construct the northern edge fire buffer zone including the earthworks for the associated edge road.
- Stage 2 – The middle catchment which is to the northeast of Stage 1 and where services can be extended upstream.
- Stage 3 – The Horse Park catchment, which will be delayed until a trunk sewer can be extended northwards up past the Horse Park Wetlands.
- Stage 4 – The high pressure zone, which will be delayed until the Elmgrove 2 reservoir is constructed.

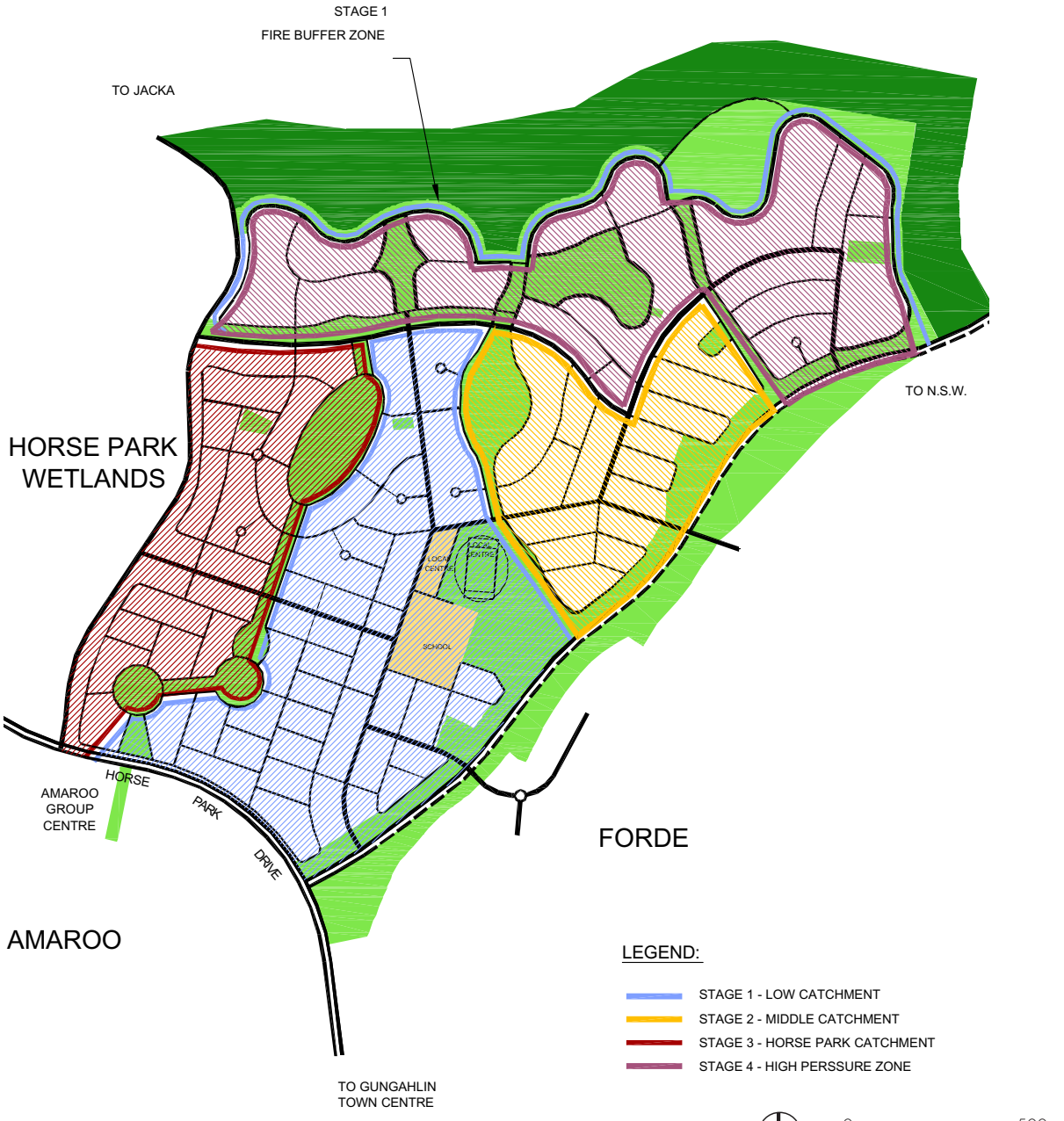


Figure 2.9.1 Staging

2.10 IMPORTANT PLANNING REQUIREMENTS

The Bonner Concept Plan (Figure 2.1.3) and Indicative Subdivision Plan (Figure 2.1.4) present an overall vision for the development of the new suburb. The Plans and the supporting drawings, diagrams and text in this report include two types of elements:

• Components (such as major roads) and design principles (such as those related to the ecological sustainability of future housing) which have been thoroughly researched and rigorously resolved and are therefore required for development and fixed through later design stages and construction

• Components (such as minor roads) which are intended to be illustrative because their exact properties cannot or should not be set in stone at this point

This section identifies and specifies all of the mandatory components and principles for Bonner.

2.10.A Road Network

A1 All roads in the following categories shown on Figure 2.3.4 are to be provided and their horizontal alignments located as shown on that drawing and on Figure 2.10.1:

- Arterial Roads (Horse Park Drive and Gundaroo Road, (1) on Figure 2.10.1)
- Sub-arterial Roads (Jacka access, (2) on Figure 2.10.1)
- Boulevard Roads ((3) on Figure 2.10.1)
- Collector Roads ((4) on Figure 2.10.1)
- Edge Roads

A2 Road connections to Horse Park Drive made only at the two locations (5) and (6) shown on Figure 2.10.1

A3 Road connections to the new suburb of Forde made only from the relocated Gundaroo Road at the two locations (7) and (8) shown on Figure 2.10.1

A4 All turning radius to be 17.5m minimum

A5 All identified roads to comply with the following design parameters:

Road Type (Figure 2.3.5)	Reservation Width	Carriageway No./ Width (per carriageway)	Path Type / No. / Width P = pedestrian SP = shared	Drainage S = Swale R = Roll-over Kerb V = Vertical Kerb F = Flush Kerb	Street Trees N = Native E = Exotic L = >22m M = 15-22m S = <15
Gundaroo Parkway Arterial	73m (inc edge rd)	Arterial: 2/11m (inc 2 x cycle lane) (ultimate) Edge: 1 / 5.5m	Arterial: 2 x SP/2m (ultimate) Edge: 1 x P/1.2m	Arterial: S Edge: S	Arterial: NL Edge: NS
Jacka Sub-arterial	40m	1 / 11m	1 x SP / 2.5m	S	NL
Bushfire Edge Road	20m	1 / 7.5m	1 x P / 1.2m	R	NS
Boulevard	36m	2 / 5m (inc 2 x cycle lane)	2 x P / 1.2m	S	EM

A6 The Bushfire Edge Road is to be located within the Bushfire Inner Asset Protection Zone which is continuous along the northern, north-eastern and western boundaries of Bonner as shown in Figure 2.10.1. Other Edge Roads shall be located generally where shown on Figure 2.10.1. The aggregate length of Edge Roads along the eastern boundary of the suburb adjacent to the arterial road to Gundaroo, shall be no less than 50% of the total length of the eastern boundary. Edge Roads adjacent to Horse Park Drive and the sub arterial road between Bonner and Jacka along the western boundary of the suburb continuous as shown on Figure 2.10.1 to ensure housing "faces" these roads.

A7 The straight portions of the Boulevard Road system numbered (13) and (14) on Figure 2.10.1 aligned exactly on axis with the communications tower on Black Mountain. The straight portion of the Boulevard system numbered (15) on Figure 2.10.1 aligned on axis with Mount Ainslie.

2.10.B Public Transport

B1 Designated bus routes shall be provided within Bonner such that 90 percent of all dwellings are within 400 metres walking distance of a bus stop. Bus routes shall:
- use Arterial, Sub-arterial, Boulevard or Collector Roads only, as shown on Figure 2.3.4
- provide access to the Local Centre in Bonner, The Group Centre in Amaroo and commuter routes to Gungahlin Town Centre and Civic
- provide direct access for school children between Forde and Bonner Primary School

Possible bus routes are illustrated in Figure 2.3.8.

2.10.C Pedestrian and Cycleway Network

C1 Pedestrian paths, cycle lanes and shared paths shall be provided as follows and shown on Figure 2.3.7:

- On-road cycle lanes on all Arterial, Sub-arterial Roads, Boulevard and Collector Roads
- Off-road shared paths through public open space corridors and alongside Arterial and Sub-arterial Roads
- Off-road pedestrian paths through public open space corridors
- Pedestrian paths alongside roads generally as shown in the table in A5 above

C2 To assist safe access to the school, pedestrian underpasses constructed in association with the north-south floodway immediately to the east of the playing field where it is crossed by the Boulevard, (16) on Figure 2.10.1, and Gundaroo Road, (17) on Figure 2.10.1. Traffic signals to be installed at the front of the school at the intersection of the Boulevard and Collector Road to Jacka (18) on Figure 2.10.1.

2.10.D Public Open Space

D1 Public open space provided within Bonner generally in the locations and amounts shown in Figure 2.5.1. This public open space shall include:

- A multi-purpose sports field immediately to the north of the school site – (9) in Figure 2.10.1
- The aboriginal scarred tree identified in archaeological studies -- (10) in Figure 2.10.1
- Existing trees except those deemed to be in poor condition

2.10.E Community Facilities

E1 Land with a minimum area of 3.0 hectares designated for a government primary school generally in the location shown on Figure 2.1.3 and at (11) in Figure 2.10.1. In addition:

- A service road provided between the western boundary of the school site and the adjoining Boulevard road for the full length of the school boundary
- The primary address ("front door") of the school located on the western boundary adjoining the service road

E2 Land with a minimum area of 0.6 hectares designated for a Local Centre and Community Facilities in the location shown on Figure 2.1.3 and at (12) in Figure 2.10.1. In addition:

- The Local Centre presenting an active frontage (entry doors and glazed openings) to the Boulevard road adjoining its western boundary
- Parking for the Local Centre and Community Facilities accessed from a service road along the eastern and southern boundaries of the site
- Parking for the Local Centre, Community Facilities and adjoining sports field designed to be shared between the three facilities to reduce the total number of spaces

E3 Land with a minimum area of 1000 square metres in the north west part of the suburb

designated for a telecommunications facility.

E4 To meet the future needs of an aging population in Gungahlin, Bonner has been identified for a Residential Care Accommodation (RCA) facility. An RCA facility is defined by the Territory Plan as the use of land by an agency or organisation that exists for the purposes of providing accommodation and services such as the provision of meals; domestic services and personal care for persons requiring support. Although services must be delivered on site, management and preparation may be carried out on site or elsewhere.

To ensure that an appropriate site is identified and reserved for the RCA facility, the following requirements apply:

- Be located within a Residential Land Use Policy Area, as defined by the Territory Plan;
- Be within 400m from a Group Centre;
- Be approximately 5 hectares in site area;
- Development has a maximum plot ratio of 0.35:1 (35%);
- Be located adjacent to or near Urban Open Space and parks;
- Be located close to public transport;
- Be located adjacent to a pedestrian path network to access open space, the group centre and public transport;
- Be located to minimise crossing major roads with high traffic volumes to reach retail facilities and other services or a safe pedestrian crossing be provided; and
- Be located not to have a significant adverse impact on surrounding residential development.

Clarification and assessment of the specific demand/need for Residential Care Accommodation facilities within Casey will be undertaken closer to the date of land release. If all or part of the identified sites are not required for aged care, the land may be released for residential purposes only.

2.10.F Stormwater Management and Water Sensitive Urban Design

F1 The suburb developed in accordance with the ACT Government policy "Think water, act water", a strategy for sustainable water resource management in the ACT" or its successor. One of the key objectives specified in the strategy is to "facilitate the incorporation of water sensitive urban design (WSUD) principles into urban, commercial and industrial development". Guidelines for the implementation of WSUD are currently being developed. These guidelines will provide more detailed requirements for new developments. Until these guidelines are published, the following requirements are to be met in line with the "Think water, act water" strategy.

F2 Under ACT Government policy, the following targets are to be achieved:

- A reduction in mains water usage per capita of at least 25% compared with 2003 levels. The 2003 level taken as 174 kilolitres per person per year.
- The level of nutrients and sediments discharged from the site is no greater than from a well managed rural landscape. The use of 'at source' water quality control measures such as road verge swale drains used to the maximum.
- The intensity and volume of stormwater runoff from the estate for a runoff event that occurs once every 3 months is no more than if the site were in an undeveloped rural state.
- Peak stormwater flows from urbanised catchments retarded back to predevelopment conditions.

F3 With residential blocks the plumbing should consider:

- Separation of greywater and blackwater drainage to the building edge for all ground floor single residential dwellings.
- Separation of water supply to toilets and washing machine cold water taps to enable future supply to these from a rainwater tank or other alternative water supply.
- A rainwater collection system with a minimum capacity of 5,000 litres per dwelling to

supply toilets as a priority and irrigation.

2.10.G Tree Retention

G1 All trees identified as Exceptional in the Bonner Residential Estate Tree Assessment retained. Trees categorised as High retained wherever possible.

G2 The aboriginal scarred tree at (10) in Figure 2.10.1 retained and incorporated into the public open space at this location in an appropriate local park design.

G3 Variations to an agreed Draft Tree Management Plan will require renegotiation with and approval by Environment ACT and support from the ACT Planning and Land Authority.

2.10.H Landscape Treatments

H1 Street trees on Arterial, Sub-arterial, Boulevard and Collector Roads predominantly exotic species generally arranged in a formal manner (equi-distant from kerbs and equally spaced).

H2 Street trees on Major Access, Access, Edge and Cul-de-sac Roads predominantly native species, preferably endemic and generally arranged in an informal manner.

H3 Two or three tree species shall predominate for the street tree planting of a residential precinct, supplemented with one or two complimentary species for variety and interest.

H4 In order to control the spread of Love Grass, Chilean Needle Grass and weeds generally, no topsoil may be removed from Bonner and exported elsewhere. In addition, only topsoil which has been sterilised or otherwise treated to remove weeds may be imported to Bonner from elsewhere.

2.10.I Residential Design Controls

I1 Housing types and minimum numbers should meet the following requirements:

Housing Type	Minimum Block Size	Minimum Overall Number of dwellings	Minimum Number of dwellings in Stage 1
Low Density (Detached)	500m²	1,300	600
Low Density in Clusters	800m² per dwelling	300	0
Medium Density (Attached/Row/ Courtyard)	250m²	400	250

I2 Service lanes provided for all sections on which Medium Density (Attached) Housing is provided and for the sections adjoining the Boulevard Road between the relocated Gundaroo Road and the local centre, where individual driveway access is not permitted (as shown on Figure 2.10.1). A service lane must:

- have a minimum width of 8.0 metres, with garages set back a further 1.0 metres so that the minimum distance between a garage and boundary fence opposite is 9.0 metres and the minimum distance between two opposing garages is 10.0 metres
- be connected to and accessed from only the roads with which it runs parallel, so that the service lane makes a 90 degree turn at each end and does align across any road with a service lane on an adjoining section
- contain street trees
- contain landscaped medians or islands where it has a straight run of more than 100 metres
- be connected to roads with pedestrian / cycle laneways where appropriate

2.10.J Further Investigations

J1 Further survey for the Golden Sun Moth will be required during the detailed design phase in the areas identified as 'Secondary native grassland and regenerating woodland, including patches previously identified as Golden Sun Moth habitat' in Fig 6.1.1 Opportunities and Fig

6.1.2 Constraints drawings and Appendix B: Fauna and Flora Assessment.

J2 Further survey, investigation and testing of the aboriginal and cultural heritage issues will be required during the detailed design phase.

J3 Further survey, investigation and testing of the contamination issues will be required during the detailed design phase.

J4 Engage an Environmental Auditor (Contaminated Land) and instigate testing to determine the quality of the soil, groundwater and stormwater and to determine the extent and nature of remediation that may be required for the contaminated areas.

J5 Prior to the design and construction of urban areas, which drain to the Horse Park Wetlands, a comprehensive geohydraulic survey and stormwater management plan must be completed.

J6 Closer to the release date, an assessment to confirm the need for Residential Care Accommodation facilities is required.

2.10.K Bushfire Risk Assessment

An independent Bushfire Risk Assessment has been carried out on the final Concept Plan and Indicative Subdivision Plan. Refer to "Draft Bushfire Protection Measures for the Bonner Urban Release Area, ACT, June 2004", prepared by Conacher Travers and provided in Appendix C.

The Assessment recommends that urban development proceed within the study area in accordance with specific controls relating to design and land management regimes set out in the Assessment.

The general recommendations include:

- An Inner Asset Protection Zone of 40 metres minimum width measured from the front building setback on blocks abutting the mandatory fire edge road to the edge of the urban land use area where shown in the Assessment. This zone is to contain the fire edge road, possible fire trail, cut-off drains, rural type fence to delineate the edge of the zone, vegetation and landscaping to specified minimum design and management standards
- An Outer Asset Protection Zone of 40 metres minimum width measured from the outer edge of the Inner Asset Protection Zone where shown in the Assessment. This zone is to contain an alternative position for a possible fire trail and vegetation to specified minimum design and management standards
- Level 1 Building Code of Australia building requirement for the first 100 metres measured from the front building setback on blocks abutting the fire edge road into the suburb where shown in the Assessment
- Recommendations for the design of landscaping within blocks and open spaces contained within the area of Level 1 building requirements.

The Bonner water supply network is to include a water main along the entire length of edge roads within the estate. This main will supply the adjacent residents and also supply emergency services vehicles during fire events. The main will need to be sized in order to supply sufficient pressure in a fire event to meet Emergency Services Authority requirements and ActewAGL standards.

A further independent Bushfire Risk Assessment undertaken at the preparation of the Estate Development Plan/Implementation Plan or detail design stage and the outcomes incorporated into the design to the satisfaction of the ACT Planning and Land Authority, the Fire Management Unit of DUS and the Emergency Services Authority and shall incorporate any new policies prepared by the Territory for fire management of new estates.

2.10.L Cat Containment Policy

The ACT Government has a containment policy that requires all cats in the new suburb of Bonner to be permanently contained within house properties at all times. The containment is aimed at keeping cats out of adjacent high value nature conservation reserves. The measures are particularly important as Mulligans Flat Nature Reserve has populations of two resident bird species, namely the Hooded Robin and the Brown Tree Creeper which are threatened with extinction.

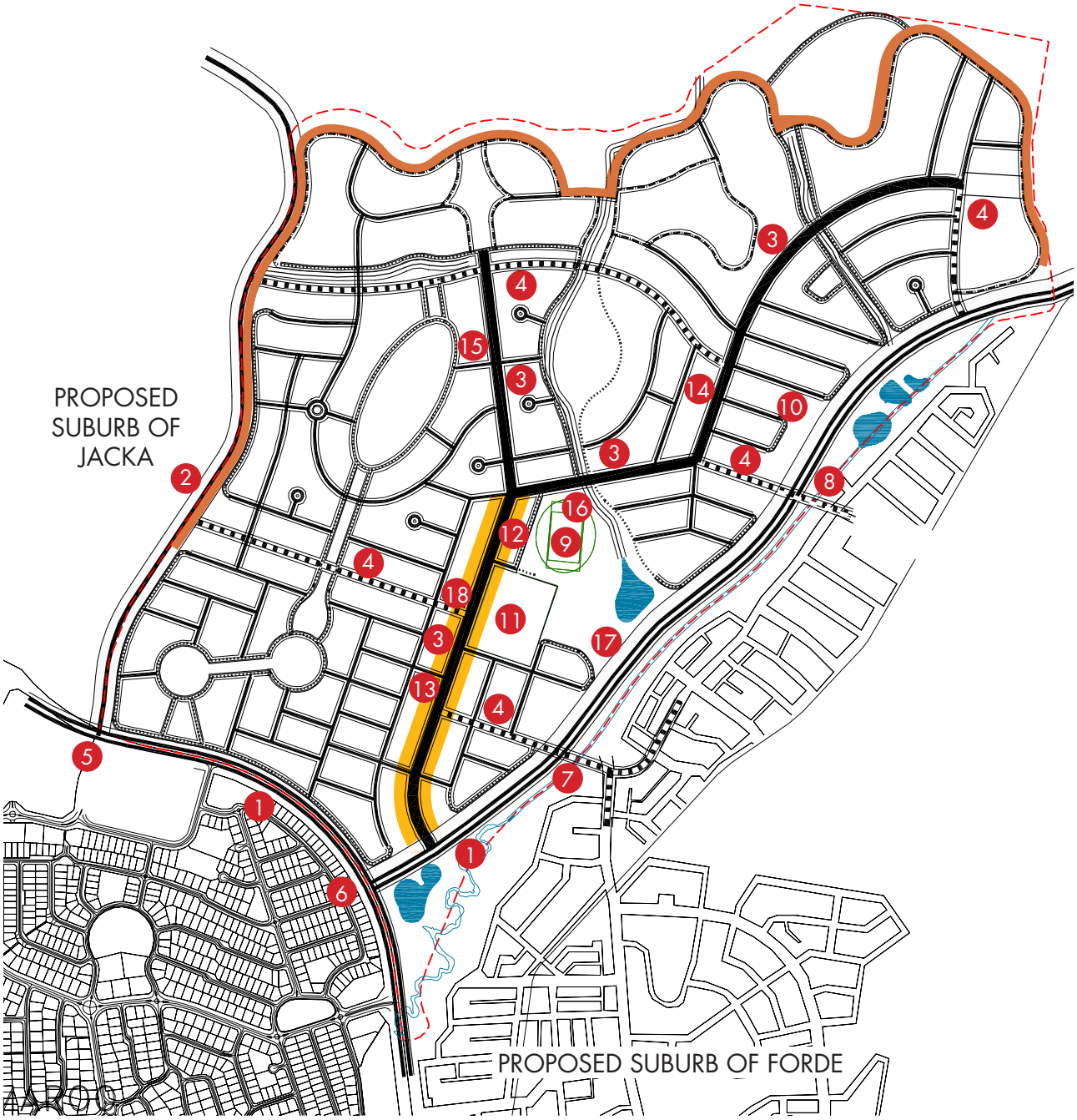


Figure 2.10.1 Important Planning Requirements Plan